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POLICY BRIEF

Regulating Carbon Emissions in Canada

Oil and Gas Greenhouse Gas Regulations: The implications of alternative proposals

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Abstract

Canada's oil and gas industry is currently negotiating with provinces and the federal government over new regulations that will be rolled out nationally. Specific proposals are finally emerging that will define the greenhouse gas emission reduction ambitions and costs of nationally important regulations.

In this policy brief, IISD explains the economics behind the proposals and provides one view on their cost and emission reduction implications. We think it is worthwhile to reveal the trade-offs of the proposals to provide a common information base to inform ongoing discussions.

While all proposals on the table will deliver emission reductions at costs that seem reasonable, a 40 per cent intensity standard with a two-tiered price ceiling could strike a good balance. Such a policy could deliver 42 megatonnes (Mt) of compliance in 2020, at an average cost of $28 per tonne or $0.42 per barrel of oil produced. One compliance pathway that is being contemplated is payments in lieu of emission reductions. The amount of emissions reduced would depend on how these payments are spent. Ideally, payments would be oriented to some mix of short-term emission reductions and long-term technology investments.

Policy Issue and Context

The governments of Canada and Alberta face increasing pressure at home and abroad to clean up greenhouse gas (GHG) emissions. The federal government seeks to demonstrate the policy steps it is following to achieve Canada's 2020 GHG emission target of 17 per cent below 2005 levels. At the same time, controversy over the Keystone XL Pipeline has increased pressure (Financial Post Staff & Hussain, 2013) on Alberta and Canada to ramp up policy to help ensure market access. As a result, the oil and gas sector is squarely in federal and provincial regulatory sights, with federal, provincial and industry negotiations ongoing since last summer.

The three proposals on the table (Vanderklippe, 2013) have national implications. Canada's current GHG policy path sees federal regulators establish a national performance standard and then provincial regulators design policies that meet the standard or is equivalent. Alberta is at the leading edge of provincial policy, and Alberta policy choices could establish a template for other provinces. As a result, ongoing negotiations could very well establish the basis for federal regulations that will be applied nationally.

While none of these proposals can be verified as definitive negotiating proposals, all proposals pair an emission-intensity improvement with a price ceiling per tonne of carbon dioxide equivalent (CO_2e). Also, the proposals signal a preference by all parties to align with Alberta's Specified Gas Emitters Regulation (SGER). Instrument choice seems to be converging. Given the advanced state of the negotiations, it is now useful to assess the cost and GHG implications of the proposals.

So how ambitious are the proposals? Do they provide the sector with the environmental street cred needed to calm market access waters? Do the proposals cast a shadow of doom over industry investment? These are important questions with billion-dollar and global climate implications.

In this note, IISD first provides a guide to interpreting the main design elements of the proposals. We then provide economic and emission modelling results and commentary to highlight possible outcomes under scenarios defined by these policy proposals. We adopt a national policy perspective, assuming the main elements of the proposals will be rolled out across all Canadian oil- and gas-producing facilities.

The Numbers that Matter

All of the proposals pair an emission-intensity improvement target with a price ceiling per tonne of CO_2e (e.g., 20 per cent/$20).[1] Together, these parameters interact to set the compliance obligation, the marginal incentive to reduce emissions and the cost of the proposal to emitters.

The first key element in the proposals is the required emission-intensity improvement. This number defines the total compliance obligation that regulated firms will face. It does not in and of itself set the emission reductions that can be expected, but instead interacts with the price ceiling and compliance mechanisms[2] to determine GHGs reduced. Proposals on the table are purported to seek an intensity improvement between 20 and 40 per cent.

[1] All dollar amounts are listed in Canadian currency unless otherwise indicated.
[2] The SGER enables firm reductions, firm carbon transfers, emission reductions from unregulated sectors (offsets) and payments in lieu of emission reductions into a technology fund. Complete details of the SGER are available at http://canlii.ca/en/ab/laws/regu/alta-reg-139-2007/latest/alta-reg-139-2007.html

The policy objective of the intensity target is to reduce emissions per barrel of oil produced or units of natural gas by a certain percentage in 2020 relative to a historical base year. The choice of fixed base year matters since the emission intensity of the sector is falling in time as new, more energy-efficient capital stock is deployed. Against 2005 levels, the intensity improvements contained in the three proposals are likely to deliver little, given ongoing improvements. But against today's emission performance, a more likely benchmark, the 2020 compliance ask would be significant and could do much to address the Government of Canada's emission gap. However, recent analysis by IISD indicates that it is unlikely the sector can achieve much more than a 20 per cent intensity improvement by 2020 at costs short of $100 per tonne (Figure 1).

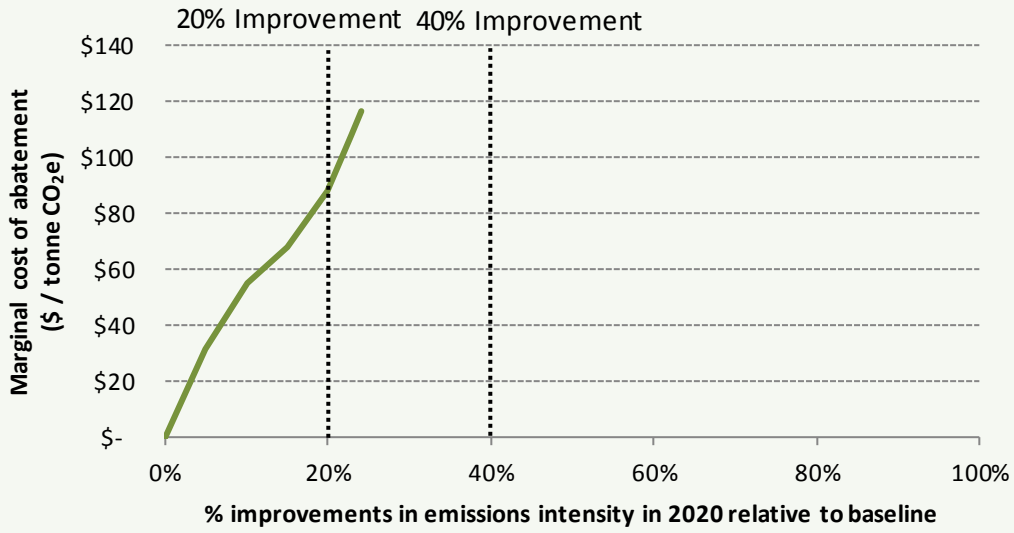

FIGURE 1. EMISSIONS INTENSITY COST CURVE OIL AND GAS SECTOR IN 2020

Source: Sawyer & Beugin, 2012

This likelihood of high costs for even modest intensity improvements between now and 2020 makes the cost-containment element of the proposals—the dollar-per-tonne price ceiling—critical.

The dollar value defines the maximum cost of the policy for emitters, containing costs for firms and limiting the potential competitiveness impact of an ambitious GHG target. But while this mechanism provides cost certainty for emitters, it also introduces uncertainty in the quantity of actual reductions the policy will deliver. The proposals enable firms to first seek solutions to reduce emissions at costs less than the per-tonne "price ceiling." In Alberta's SGER, regulated entities can reduce emissions within their facilities, buy emission reductions from other facilities or buy offset reductions from unregulated sources approved as "offsets'" under the SGER. When all abatement opportunities below the price ceiling are exhausted, payments in lieu of emission reductions can be made into a technology investment fund to square up the emitter's compliance obligation (Alberta Environment and Sustainable Resource Development, n.d.).

Depending on how the technology fund is designed, compliance payments may or may not lead to additional emission reductions. The first option for disbursing the fund payments includes investments for technology research, development and demonstration (RD&D), which can drive down the long-term costs of technology deployment and

hence lower emission reduction costs. But the risk is that RD&D investments underperform and do not deliver longer-term GHG gains, thus reducing the effectiveness of the policy. The second option for fund disbursement is to invest in short-term emission reductions from sectors outside of the oil and gas sector (and not covered as offsets). This option does not help with RD&D in the oil and gas sector and so limits the promise of reducing technology costs in the longer term. Some mix of these two options would balance the need to drive down low-emitting technology costs in the oil and gas sector with delivering short-term and verifiable emission reductions from the policy.

When assessing the proposals, it is also critical to distinguish between the incentive to reduce emissions and the impact of the proposals on firm profits and, hence, investment. This is a much-muddled concept in the press, with many commentators arguing that the average compliance cost of the policy, or the cost of the proposal across all barrels of oil, is weak relative to, say, British Columbia's carbon tax. This comparison is misleading, as the price ceiling of the proposals defines the price signal, or marginal cost that affects low-emitting technology deployment, driving down the GHG intensity of production. Firms will make choices about technology choice and compliance options to reduce the intensity of their production up to the carbon price ceiling or marginal cost of the policy.

The average cost tells us more about the impact on profits and returns to investment, with an indirect link to emissions if the policy reduces investment in new capital stock. The average cost of the proposal per barrel of oil or unit of gas is calculated as the total compliance cost to achieve the intensity standard divided by the total quantity of oil or gas produced.[3] The average cost is lower than the marginal cost because the intensity standard requires compliance on only a fraction of total emissions per barrel, while some abatement costs less than the maximum ceiling price.[4]

To achieve reductions while minimizing costs and hence competitiveness impacts, the ideal policy is one that has the highest marginal cost to reduce the intensity of production and has the lowest average cost to dampen competitiveness impacts. If, however, the objective is to slow new oil sands development, then a higher average cost matters more. But dividing the cost to the policy across all emissions and calling it a weak incentive to abate emissions is flat out wrong.

The Proposals

Table 1 provides the main elements of the proposals as they have been reported. Note the differentiated intensity standard for oil sands and heavy oil producers is higher than that required for light oil and natural gas producers. This assumed split reflects our interpretation of the proposals being negotiated. A forth proposal is added with a 40 per cent intensity ask and a two-tiered tech fund payment structure. We present this hybrid scenario with the same emission intensity ask as the 40/40 proposal to isolate the impact of the two-tier price ceiling.

[3] Average cost per unit of emissions is the compliance cost divided by the emission reduced.
[4] Upward sloping marginal cost curve, with total cost being the area under the curve.

TABLE 1: SCENARIOS

SCENARIOS FOR NATIONAL OIL AND GAS GHG REGULATIONS	INTENSITY STANDARD IN 2020 % REDUCTION FROM BASE YEAR		PRICE CEILING FOR TECHNOLOGY FUND PAYMENTS
	OIL SANDS AND HEAVY OIL	CONVENTIONAL OIL AND GAS	
1. 20/20	20%	20%	$20
2. 30/30:60	30%		Tier 1: $30; Tier 2: $60
3. 40/30:60 (hybrid)	40%		Tier 1: $30; Tier 2: $60
4. 40/40	40%		$40

GHG and Cost Impacts in 2020

Impacts vary across the proposals and are worth revealing to help provide a common information base to inform ongoing discussions. A number of assumptions and caveats need to be made clear prior to reviewing the outcomes predicted by modelling:[5]

- Our four policy scenarios cover all oil and gas emitters in Canada, but not the refining sector.
- The compliance year is 2020.
- Emission forecast is 149Mt in 2020.
- Compliance pathways are identical to Alberta's SGER: firm reductions, firm emission reduction credit trading nationally, low-cost domestic reductions and technology fund payments.
- Low-cost domestic reductions (LCDR) are sourced from uncovered energy sectors nationally and not from land use, agriculture or forestry.
- LCDR supply assumes protocols covering a wide range of project types and reductions are nationally sourced. Cost curves for LCDRs are referenced from Sawyer, Stiebert and Beugin (2011). To the extent that LCDR supply is constrained, prices rise in the scenarios.
- Market-clearing LCDR costs are assumed to be a discount of 80 per cent of the technology fund price.
- Intensity improvements in 2020 are achieved against an historical emission intensity in 2011.
- There is a 3 per cent total autonomous intensity improvement between 2011 and 2020. This means that, absent policy, there are reductions happening anyway, and the emitter does not need to work as hard to achieve the intensity standard. For example, if there is a 3 per cent intensity improvement absent policy between the base year 2011 and the compliance year 2020, then a 20 per cent intensity standard is really a 17 per cent target.
- In scenarios two and three, tier-one compliance is capped at 30 per cent, meaning firms can only use 30 per cent of the total compliance obligation at the $30 price ceiling. Tier 2 is unlimited.

Table 2 provides the compliance and cost implications of the proposals.

[5] For a more complete overview of the modelling approach and assumptions, see Sawyer and Beugin (2012).

TABLE 2: NATIONAL GHG AND COST IMPACTS IN 2020: ALL OIL AND GAS PRODUCTION

	COMPLIANCE (MT)				COST IMPACTS ($2012)		
	Total	Sector	LCDR	Tech Fund	Average Cost ($/tonne)	Per bbl. Before tax/royalty*	Total (mln)**
1. 20%/$20	21 Mt	4 Mt	10 Mt	7 Mt	$17	$0.12	$348
2. 30%/$30:$60	32 Mt	6.6 Mt	15 Mt	9 Mt	$25	$0.35	$780
3. 40%/$30:$60	42 Mt	14 Mt	15 Mt	13 Mt	$28	$0.42	$1,172
4. 40%/$40	42 Mt	6.8 Mt	21 Mt	15 Mt	$33	$0.49	$1,370

** Provided as an indicator of cost. Does not include natural gas policy costs. Oil costs divided by oil production, before tax and royalty interactions reduce costs further.*

*** Undiscounted costs. In theory, these 2020 costs would be deflated by 50 per cent to reflect the time value of money (net present value @ 10 per cent discount rate).*

Source: IISD modelling

In scenario one, the 20/20 proposal delivers the least amount of total compliance and in-sector GHG reductions of the proposals, with total compliance in the order of 14 per cent below the forecast 2020 sector emissions. Interestingly, the average cost in this proposal is close to the price ceiling value of $20, indicating the limited in-sector reductions available at low costs and the high use of the technology fund. This observation underscores the importance of the compliance flexibility inherent in all the proposals. In the scenario, average compliance costs are $17 per tonne, or about $0.12 per barrel of oil before tax, and royalty interactions would lower this cost further. To the extent the compliance payments lower taxes and royalties, the provincial governments and Canada share in this cost.

A twist on the single-tier price ceiling of $20 or $40 is the two-tiered price ceiling of $30 and $60 in scenarios two and four. In our interpretation of the two-tier scheme, the first dollar amount sets the first compliance price ceiling that can be used for some portion of overall compliance and the second sets the unlimited compliance amount. Under the two-tier price ceiling, firms exhaust all in-sector abatement opportunities below the first price tier of $30 plus any LCDRs below this lower tier price. Additional in-sector and LCDR compliance opportunities are next exhausted up to the second-tier price of $60, at which point it is cheaper to round out compliance with tech fund payments rather than through firm abatement or reduction purchases.

Scenario two is more ambitious relative to scenario one. The sector has significantly higher costs, with total costs doubling when the 20 per cent intensity standard is increased to 30 per cent. Compliance in the scenario occurs primarily below the first-tier price, with 31 Mt of the 32 Mt target achieved. Then, with the second-tier price in play, in-sector abatement delivers an additional tonne of reduction. Table 3 shows the ordering of compliance in our stylized scenario as well as the average costs per compliance pathway.

TABLE 3: SCENARIO TWO (30%/$30:$60) COMPLIANCE AND COST IMPLICATIONS

COMPLIANCE PATHWAY	FIRST TIER $30		SECOND TIER $60		PROPOSAL TOTALS		
	COMPLIANCE (MT)	AVERAGE COST	INCREMENTAL COMPLIANCE	AVERAGE COST	COMPLIANCE (MT)	AVERAGE COST	COST (MLS)
Sector	5.6 Mt	$15	1.01 Mt	$41	6.6 Mt	$19	$125
LCDR	15 Mt	$24	0 Mt	$48	15 Mt	$24	$371
Tech Fund	9 Mt	$30	0 Mt	$60	9 Mt	$30	$284
Total	**31 Mt**	**$24**	**1.01 Mt**	**$41**	**32 Mt**	**$25**	**$780**

In theory, for a given intensity standard, the two-tiered price ceiling can drive more emission reductions from emitters given the higher marginal incentive at $60. It can also do so at a lower average cost than a single-tier system with a lower marginal price, say $40. In the two-tier scenario three, average costs are lower than scenario four, as the tiers interact to weigh more out-of-sector intensity improvements in the lower cost range, while firm incentives to abate remain high. This is indeed borne out in the scenarios where the two-tier hybrid scenario three delivers more in sector reductions at lower costs relative to the single-tier price ceiling in the 40/40 proposal. Figures 2 and 3 highlight the scenario results, with Table 4 providing the compliance and cost impacts of each price tier.

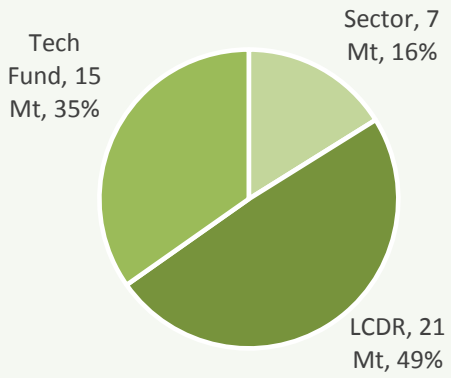

FIGURE 2: 40%/$40 AVERAGE COST FOR 41 MT $33

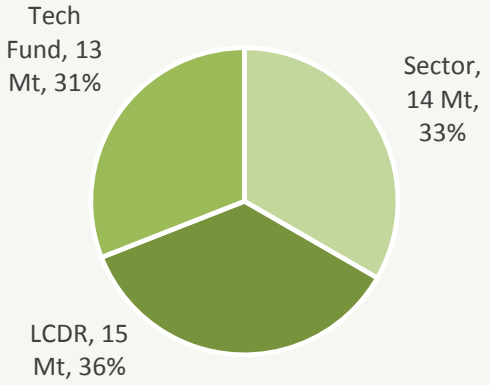

FIGURE 3: $40/$30:$60 AVERAGE COST FOR 41 MT $28

TABLE 4: SCENARIO THREE COMPLIANCE AND COST IMPLICATIONS

	FIRST TIER $30		SECOND TIER $60		PROPOSAL TOTALS		
	COMPLIANCE (MT)	AVERAGE COST	INCREMENTAL COMPLIANCE	AVERAGE COST	COMPLIANCE (MT)	AVERAGE COST	COST (MLS)
Sector	5.6 Mt	$15	8.3 Mt	$41	14 Mt	$30	$423
LCDR	15 Mt	$24	0 Mt	$48	15 Mt	$24	$371
Tech Fund	14 Mt	$30	0 Mt	$60	13 Mt	$30	$284
Total	**42 Mt**	**$25**	**8.3 Mt**	**$42**	**42 Mt**	**$25**	**$1,172**

With **the 40/40 proposal**, we see how fast costs rise as the intensity standard increases, again reflecting the limited abatement opportunities in the sector and the importance of the price ceiling. In this scenario, tech fund compliance is significant and in the order of 46 per cent of total compliance. Whether or not these "in-lieu" payments to the tech fund deliver future reductions is an open question, with concerns raised by environmental non-governmental organizations that the current proposals provide little incentive to reduce emissions (Horne, Demerse & Partington, 2013). Still, the 40/40 proposal sets an incentive to abate comparable-to or well-above world-leading GHG policies such as British Columbia's carbon tax at $30, California's carbon permits at $13 (California Air Protection Agency, 2013) and European Union permits trading at $3.75 (as of April 18, 2013).

The 40/40 proposal is also in step with industry expectations on future carbon exposure (Sustainable Prosperity, 2013). If we are to believe industry, project hurdle rates, which set "go" or "no-go" investment decisions, already account for a $40 marginal cost. We cannot therefore say that formalizing this $40 cost will significantly affect project economics and therefore investment decisions. Formalizing this shadow cost will certainly hit sector profits, but that seems unlikely to cast a long shadow of doom over industry investment. Indeed, the average cost of all the proposals is certainly well below one dollar per barrel produced nationally, even before tax and royalty interactions reduce the impact further.

While the incentive to abate in current proposals is high, the competiveness impacts are likely low. Under the proposals, a firm's total cost, and hence average cost, is just related to expenditures to comply with the intensity standard. This approach differs markedly with the British Columbia, California and European carbon-pricing systems, where firms invest in technology up to the point where it becomes cheaper to pay the carbon price and continue to emit. Total costs for the firm are then abatement costs plus the price on remaining emissions. The payments on remaining emissions have no direct impact on the quantity of reductions firms supply, and are instead an income transfer to the regulator or other emitters for carbon purchases. To put this important difference into perspective, if Alberta's purported 40/40 proposal was applied as British Columbia's carbon tax, the cost to firms in 2020 would be three times larger, given the price on their remaining emissions.

Conclusion

Taken together, the proposals on the table provide a legitimate basis to deliver emission reductions at reasonable costs, in effect balancing environmental performance and competiveness. What is striking is that the proposals are not that far apart in terms of ambition, and it seems like a compromise can be struck. The negotiations have clearly moved beyond the instrument choice debate about how best to regulate into the more important realm of setting policy ambitions.

In reviewing the proposals, the 40/40 proposal attributed in the press to Alberta combines an important emission reduction ask with a check on competitiveness risk. To the extent this GHG proposal translates into establishing greater social license to operate, profits are likely to be protected, if not increased, as market risks are dampened. The risk could be further tempered by adding a two-tier price ceiling to lower average compliance costs while delivering more firm reductions. The trade-off would be some confusion over how the two tiers interact, but the cost savings likely outweigh this limitation.

While setting a national GHG policy aligned with Alberta's 40/40 proposal won't please everyone, it strikes a good balance.

Industry, the federal government and Alberta need to shake hands and finally get on with it. Or, if we are feeling lucky, we could let our trading partners decide if Canada's carbon policy matters.

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