



Economics

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Energizing Infrastructure

by Benjamin Tal and Avery Shenfeld

In what looks to be an extended period of sluggish global growth, Canada will have to be more self-reliant in creating jobs. But our own consumers and governments are now feeling less eager to continue a debt-financed spending binge. That leaves capital spending as the last frontier where growth opportunities might allow Canada to outperform other major industrialized nations.

Government-funded public works projects played a role in softening the recession, but fiscal restraint is now the watchword. It is therefore imperative to seek out projects where a potential revenue stream could be used to leverage private sector funding or provide an economic return on any capital employed by crown corporations.

Fortunately, there are major energy infrastructure projects on the table that could fit the bill. Under discussion are a string of large-scale hydroelectric power projects from coast to coast. Private sector investment is already driving the expansion of Canada's oil sands. But pipelines and LNG facilities could also be part of the picture to expand our ability to move oil and gas to more valuable markets. Add it all up, and we have the potential to drive capital spending at a pace not seen in generations.

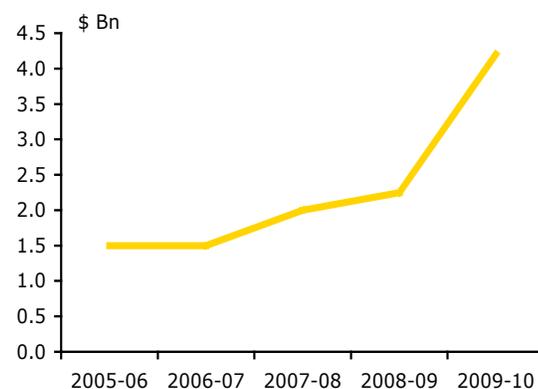
Each of these projects will have to be considered on its merits, and there are multiple stakeholders involved. There is no certainty that all will receive a green light. But by accelerating the process of

reaching a decision, and providing support where needed in loan guarantees or other private-public partnership vehicles, governments across the country could help insure that those that move forward do so when Canada's economy needs the jobs the most.

Infrastructure Deficit Continues to Rise

Infrastructure spending was the weapon of choice for most governments in their attempts to dig their economies out of the recent recession, and Canada was no exception. The ongoing \$33 billion in infrastructure investment under the Building Canada Plan, and the acceleration of spending in the 2009 budget which saw Infrastructure Canada fund a record \$4.2 billion last year (Chart 1) were helpful. But that still left much to be done to bring municipal infrastructure up to par.

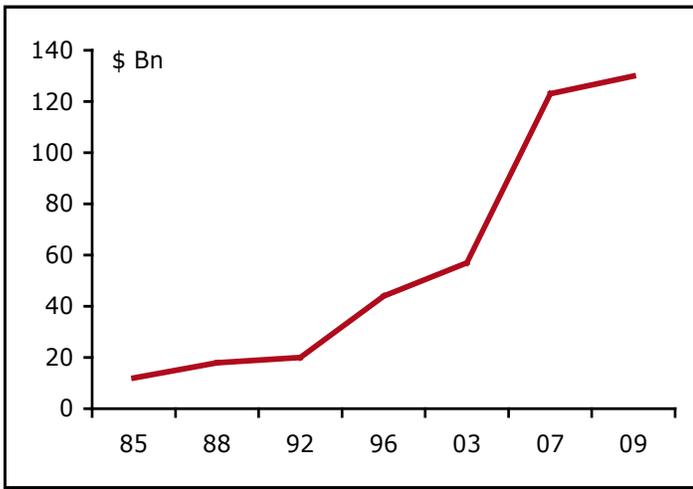
Chart 1
Federal Government Spending on Infrastructure



Source: Infrastructure Canada, CIBC

Chart 2

Canadian Infrastructure "Deficit"



Source: Federation of Canadian Municipalities, CIBC

Based on information obtained from the Federation of Canadian Municipalities, we estimate that the total additional investment needed to repair and prevent deterioration in existing municipally owned infrastructure assets currently stands at roughly \$130 billion—up from \$60 billion in 2003 (Chart 2). When we add in the additional needs for infrastructure expansion due to demographics and environmental issues, then the municipal infrastructure "deficit" balloons to well over \$300 billion.

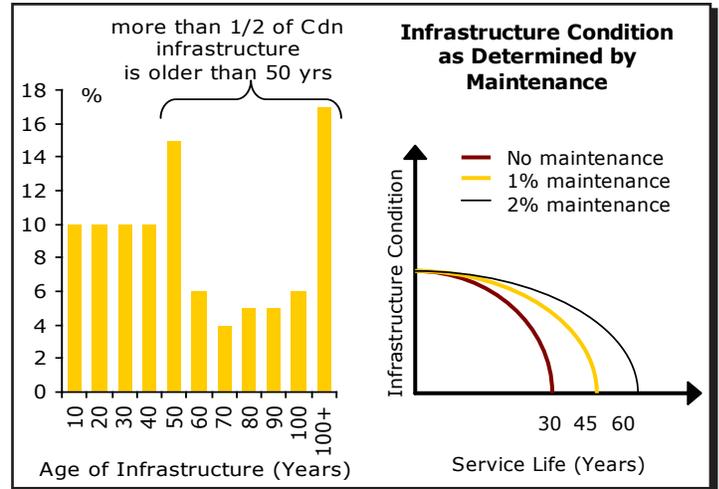
The rapid acceleration in the value of the infrastructure deficit in Canada reflects the fact that the majority of the nation's civil infrastructure is more than 50 years old, and has used up almost 80% of its life expectancy. And that life expectancy gets shorter with every year of delayed maintenance. As illustrated in Chart 3 the service life of a typical infrastructure asset can be cut dramatically due to insufficient maintenance. Maintenance costs in the mid-lifecycle of a facility normally vary between 2% and 4%. The current expenditure on infrastructure maintenance in Canada is estimated to be less than half that requirement.

Enter the Private Sector

Given the new fiscal reality, and the magnitude of the problem, it is clear that the private sector will have to play a much more dominant role in financing future infrastructure costs and assuming part of the associated risks. Instead of simply writing a cheque, governments

Chart 3

Canadian Infrastructure Aging Fast



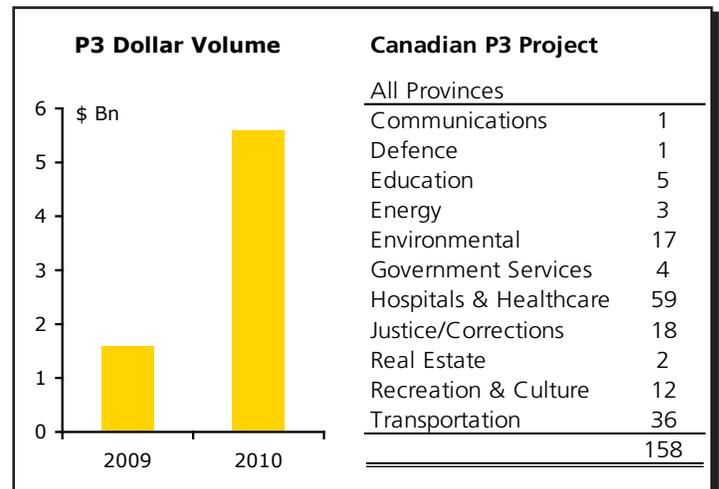
Source: FCM, CIBC

are now willing to utilize more effective ways to finance infrastructure investment. Chief among them is the growing role of Public-Private Partnerships (P3) in Canada. Many of these projects involve the participation of the private sector in designing and building infrastructure to meet public sector performance specifications, often for a fixed price, so the risk of cost overruns is transferred to the private sector. While Canada has been slow to adopt this concept, that is now changing, with no less than 158 P3 projects currently in process nation wide (Chart 4).

Fortunately, growing investor interest in these types of assets is lining up well with the growing need for private

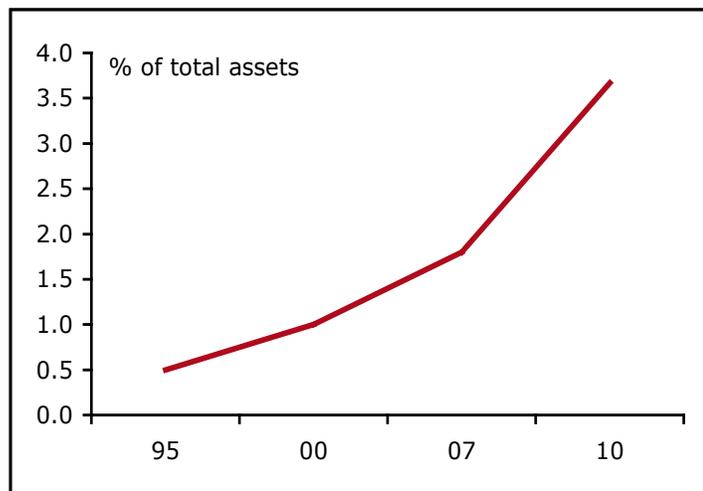
Chart 4

Public Private Partnership on the Rise



Source: CCPPP, PFM, CIBC

Chart 5

Pension Funds Investment in Infrastructure

Source: PIAC, Various Annual Reports, CIBC

funding. That is particularly true among pension funds, given their need to match long-term liabilities with stable long-term cash flows, which are increasingly hard to find in a period of ultra-low government bond yields. Given pension funds' sizeable asset base, even a minor change to their asset allocation can dramatically change the mathematics of infrastructure funding. And it's already happening. We estimate that currently roughly 3.8% of pension funds' assets are allocated to global infrastructure investment, which is almost three times the share seen a decade ago (Chart 5). That growth is likely to continue. We expect pension funds to allocate close to 7% of their assets to infrastructure by the end of the decade, adding more than \$30 billion of fresh money to this capital intensive sector. However, pension funds are not looking only at domestic opportunities, but those abroad, so competition is fierce. To keep this infrastructure money at home, there is a need for clearer regulatory oversight as well as tax changes to allow crown assets to move into the private sector.

Energy Infrastructure

With the burst of government funding for municipal projects now waning, more infrastructure investment in the coming years will be channeled into the energy sector. The sector already accounts for over 15% of total private business investment.

Of that flow, no less than 40% is now absorbed by the oil sands, which have doubled their share in the past five years. Given the large slate of projects in the pipeline,

we expect that the cumulative capital expenditure could reach close to \$95 billion by 2015 and \$180 billion by the end of the decade. This investment could work to double oil sands production, and could generate roughly 300,000 new oil sands and pipelines jobs during that period and an additional 400,000 jobs in the following decade¹.

Unplugging Oil Sands

Producing is one thing, but being able to ship that crude to the most profitable markets is another. While current export pipeline capacity out of western Canada is sufficient for today's production, that will not be the case by 2015 when increased production will exceed the capacity of refineries in the U.S. Midwest for processing Canada's heavy oil. In this context, the \$7 billion Keystone XL pipeline project, which is slated to carry oil sands crude from Alberta to the US gulf coast as early as 2013 (if approved), will play a significant role in unplugging crude flow from the oil sands. While the direct economic benefit from this project will be felt mostly in the US (roughly 20,000 jobs), Canada could greatly benefit from a significant increase in its export capacity, improved market diversification, and close to \$8 billion in increased annual revenues due to a narrower price differential between Brent and WTI.

A wider door to market access could be opened with the \$5.5 billion, 1,172 km Northern Gateway Pipeline, which would transport 525,000 barrels of oil a day from Edmonton, to the Pacific coast, where tankers would deliver them to Asia. Beyond the notable positive impact on investment and job creation (over 30,000 full year positions) the most significant benefit here is increased diversification of exports in a way that can change the economics of oil sands materially.

Capturing Oil Sands Emissions

Another growing and important infrastructure investment destination is Carbon Capture and Storage (CCS). Not too long ago, extracting oil from oil sands was technologically possible, but unfeasible economically. Today, following the structural rise in oil prices, not only are the oil sands a part of the mainstream energy supply, but soon they will become the largest source of new oil in the global economy.

Similarly, the technology to capture and store carbon is widely available now. But it is very expensive. And with no restrictions on emissions, companies have no economic motivation to apply such an option. While the

future regulatory environment is uncertain, it might see the right to emit come with a price tag. If so, injecting CO₂ into the ground would make more economic sense than spreading it into the atmosphere.

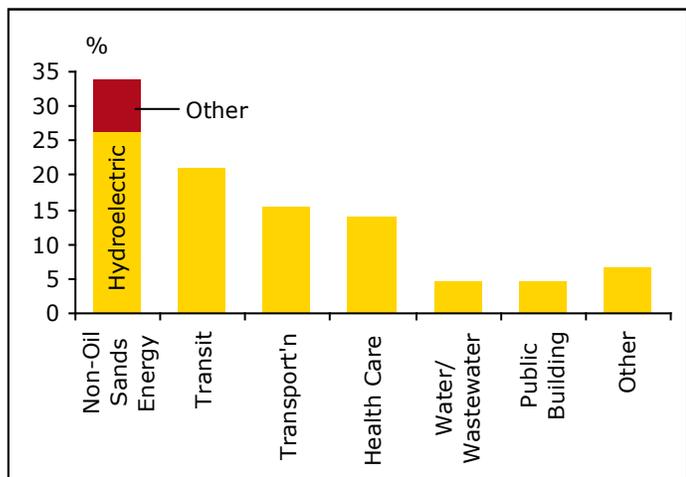
Canada has the potential to store, largely in the Western Canadian Sedimentary Basin (WCSB), as much as 600 million tonnes of CO₂ a year, roughly equal to 75% of Canada’s current annual GHG emissions. Already seven large-scale, fully integrated CCS demonstration projects are co-funded by the two levels of government and the private sector, with total investment of over \$7 billion.

Early movers will benefit the most, as they will have relatively easy access to the limited oil recovery enhancement opportunities in the WCSB zone—a fact that would reduce their overall CCS cost significantly. Look for many new oil sands facilities in the next 5-10 years to adopt pre-combustion systems, which will provide them with the option to use CCS when the infrastructure is put in place. In this context, industry leaders in CCS technologies, as well as pipeline companies, will be the first to benefit from the upcoming shift to CCS.

Beyond Oil Sands

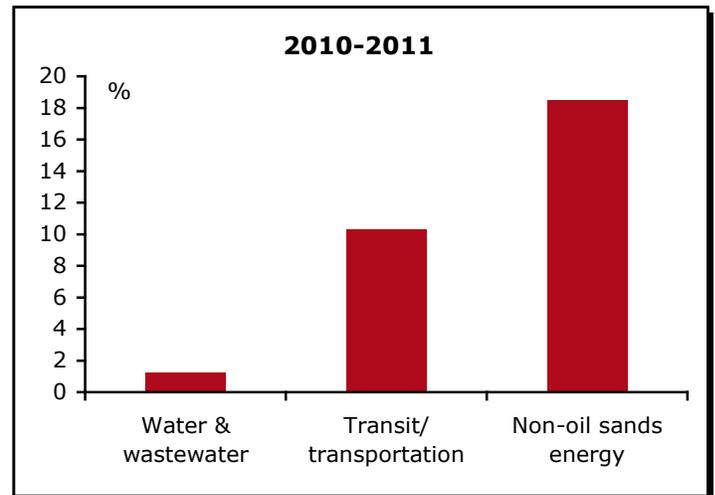
Infrastructure investment in energy goes well beyond oil sands. Indeed, stripping out the oil sands, more than a third of the remaining infrastructure dollars in the past year went to the energy sector. Of that, more than 80% was devoted to hydroelectric projects (Chart 6)². And with roughly one quarter of the country’s power

Chart 6
Distribution of Non-Oil Sands Infrastructure Spending (2010-2011)



Source: ReNew Canada, CIBC

Chart 7
Share of Private Financing in Total Infrastructure Cost



Source: ReNew Canada, CIBC

generation capacity being generated by private firms, it is hardly a surprise that private money is becoming more important in financing the ever-growing appetite for energy investment. Close to 20% of non-oil sands energy projects are being financed by the private sector, more than double the share five years ago and well above the share seen in any other infrastructure investment category (Chart 7).

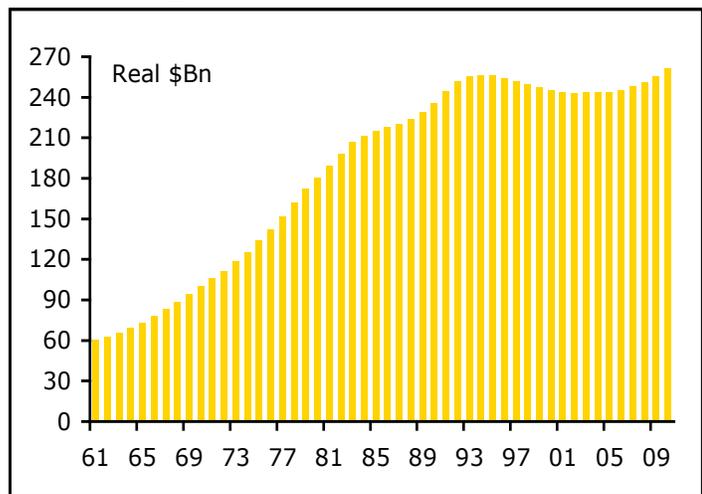
Investment in Non-Oil Sands Energy

Following decades of under-investment, the power-generating sector, and hydroelectricity in particular, is currently playing catch-up. Environmental policies across many jurisdictions are helping to push these hydro-power projects forward.

The production capacity of the electricity market has hardly changed over the past 20 years (Chart 8)—reflecting in part the improved energy efficiency in the Canadian economy, but also the reduced ability of new investments to increase productive capacity. More of each capital spending dollar is now devoted to replacement investments that simply maintain existing levels of production, a trend that has widened the gap between investment and the change in productive capacity over the past two decades (Chart 9, left). This is largely due to the fact that information technology and other short-service-life capital now comprises a growing share of total capital investment—a fact that led to an estimated 50% reduction in the average service lives of new capital

Chart 8

Productive Capacity in the Electricity Sector Was Little Changed Over the Past Two Decades



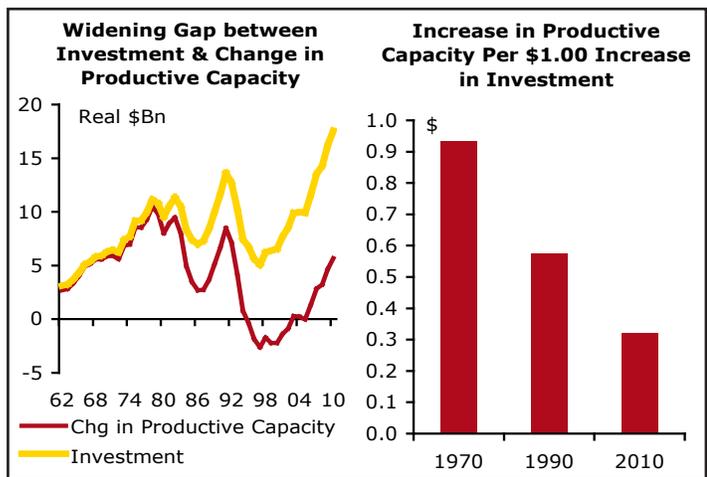
Source: Statistics Canada, CIBC

since the mid-1980s. As a result, every dollar increase in investment currently generates only 30 cents of new productive capacity vs. more than 90 cents in the 1970 and 55 cents in 1990 (Chart 9, right).

The practical implication of this trend is that capital investment in the electricity market must rise much more quickly in order to accommodate both replacement investment and the current, very aggressive expansion plans. Nearly \$50 billion worth of hydro projects are now slated for action by the end of the decade, with an estimated increase in generation capacity of 11,200 MW

Chart 9

Electricity Investment Not Lifting Productive Capacity as Quickly as in the Past



Source: Statistics Canada, CIBC

Table 1

Investment in Hydro Projects

Hydro Projects	Generation Capacity	Cost
	MW	\$Bn
Lower Churchill, NL	3,000	6.2
Romaine, QC	1,550	6.5
Conawapa, MB	1,485	7.7
Site C , BC	1,100	7.9
Mica Units 5&6, BC	1,000	0.8
Eastmain, QC	918	5.0
Keeyask, MB	695	5.6
Lower Mattagami, ON	440	2.6
Wuskwatim, MB	200	1.6
Niagara Tunnel, ON	160	1.6
Other	650	3.0
	11,198	48.5

Source: Canadian Hydropower Association, CIBC and various other sources

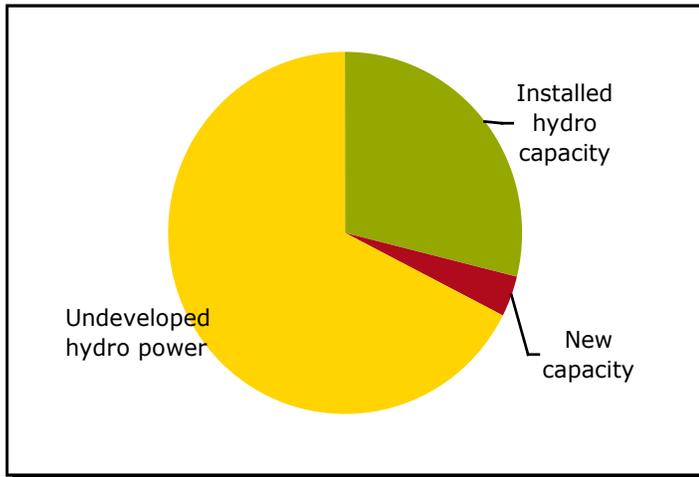
(Table 1). The large-scale \$7.9 billion (1,100 MW) Site C project on the Peace River would reverse a trend that saw British Columbia become a net importer of electricity. It would also make the most efficient use of river water that is already stored and used by two dams upstream. The Conawapa generating station on the lower Nelson River would be the largest hydroelectric project ever built in Northern Manitoba, while the Lower Churchill plan for potential sites in Labrador (Gull Island and Muskrat Falls) would increase Canada’s energy arsenal by close to 3,000 MW.

If given the green light, these projects would significantly raise Canada’s hydro-power capacity in coming years, although the total installed capacity, once new plants become operational, will still only tap about one-third of Canada’s hydro potential (Chart 10). That leaves substantial room for further investment - in hydro power going forward.

And this is just the beginning for the electricity sector. Current long-term provincial plans reveal significant increases in generating capacity from wind, solar, natural gas and other sources. New electrical generating capacity will reach nearly 40,000 MW from these sources by 2030. That would translate into roughly \$195 billion in investment over that period³.

Add to this tally the roughly \$100 billion of new investment in transmission and distribution, and the sum

Chart 10
Plenty of Room for Further Hydro Investment



Source: Canadian Hydropower Association, CIBC

Table 2
Jobs Impact of Energy Infrastructure Investment

(2010 - 2030)	
	No of Jobs
Oil Sands and Pipelines	710,000
Power Generation	292,000
Transmission and Distribution	28,000
Total	1,030,000

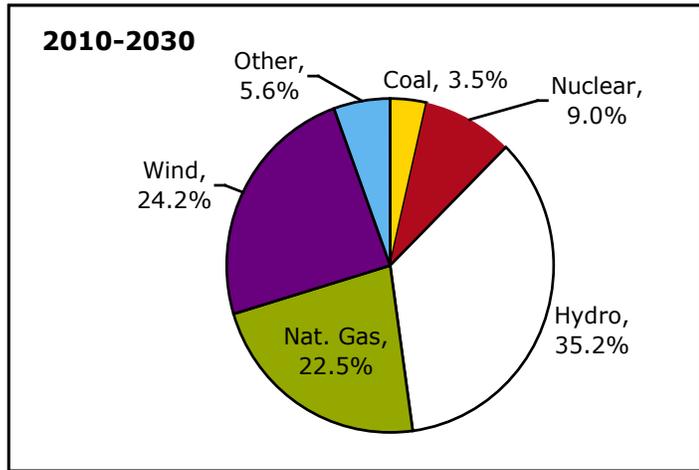
Source: CIBC calculations based on CERI, Conference Board of Canada, ReNew Canada and various other sources

is close to \$295 billion. Given the projected distribution of new generation capacity (Chart 11), we estimate that for every \$1 billion investment in the electricity sector, 1,100 jobs are created, for a grand total of more than 320,000 jobs building electricity infrastructure over the next two decades (Table 2)⁴.

Where to From Here?

Timely decision making has not always been Canada’s forte. The Mackenzie Valley pipeline, for example, has been under an on-again, off-again consideration for nearly four decades. In these troubled times, it’s imperative to get those projects deemed worthy off the drawing board much more expeditiously.

Chart 11
Distribution of New Electricity Capacity



Source: Conference Board of Canada, CIBC

Labour market slack may open up in Canada due to extended softness abroad. If we get infrastructure building going, the jobs will come, up to one million of them in the next two decades across the energy, power and pipeline sectors. The same effort could also generate the income stream needed to earn a return on both the private and public sector funds involved. With manufacturing exports being challenged by competitors near and far, Canada’s energy sector will be even more critical in maintaining a healthy trade balance in the decades ahead.

Note:
 (1) Source: CERI input-output model, CIBC calculations. The reference here is to person years of employment.
 (2) Based on Canada’s largest 100 non-oil sands infrastructure projects. Source: ReNew Canada.
 (3) Source: Conference Board of Canada.
 (4) We used the Conference Board of Canada’s projection of new electricity capacity increases for the coming 20 years as a base, and translated it to net new jobs. This was done by obtaining information on estimated job creation in past and current electricity projects to calculate net job creation per \$1 billion of investment for each of the major generation technologies (hydro, wind, nuclear, coal, Natural Gas and others) and used the distribution of projected new generating capacity (see chart 10) to calculate the weighted sum of jobs that the projected \$295 billion of investment will generate. The reference here is to person years of employment.

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