Fails to meet criteria	Not promising	Meets in some respects	Potentially meets criteria	Meets criteria

* For explanation of criteria see Box B, page 22

ASSESSMENT TABLE: **Power** (Electricity)

	Credible			Capable		Compelling			Priority approach
	Maturity	Economic viability	Social acceptability	Fit for purpose	Net-zero pathway potential	To critical stakeholders	Related costs and benefits	Economic development opportunities	
New generation									
Hydro reservoir	Mature	Closest sites already exploited. Significant capital costs for large dams and transmission linkages. Smaller projects more viable.	There can be substantial opposition from environment and Indigenous groups. Smaller projects with indigenous stake more acceptable	Yes. Provides reliable bulk power and dispatchable power to support integration of variable renewables (wind, solar)	Yes. Emissions from reservoir flooding, but these can be mitigated and decline over time.	Especially when there are local and Indigenous proponents.	Can balance intermittent renewables. Significant environmental costs.	Yes. Especially today in remote and Indigenous communities.	Medium. Yes, for smaller scale projects. Possibly over longer term for larger projects.
Hydro run of the river	Mature	Can be competitive depending on conditions	There can be opposition from environment and Indigenous groups. Less significant than for reservoir projects. Smaller projects with Indigenous stake more acceptable	Yes. Provides reliable power.	Yes.	Especially when there are local and indigenous proponents.	Modest environmental costs but less significant than reservoirs	Especially today in remote and Indigenous communities	Yes, for smaller scale projects. Possibly for larger projects depending on context.
Wind	Mature	Highly cost competitive. Often lowest incremental addition. But dealing with variability may add system costs	Considerable opposition in some areas. Softened with forms of community participation. Offshore often more acceptable.	Yes, but variable power. Large offshore projects very capable. Easily dispatchable. Weather forecasting improving.	Yes. Likely to be a fundamental pillar of net zero electricity systems. For high penetration needs storage, regional integration, or other ways to manage variability.	Increasingly to system operators because of falling costs and growing experience	No air pollution. Some environmental issues (birds, bats, visual)	Yes. Jobs and development opportunities. Community ownership in projects possible. Revenue for farms.	High Likely part of net zero emission world
Utility scale solar PV	Maturing	Increasingly cost competitive, especially in areas with high solar irradiance.	Generally high. But some opposition in rural areas as part of a general anti-renewable backlash.	Yes, but variable. Less effective in cloudy and low temperature environments with heavy snow cover. Weather forecasting improving	Yes. Likely to be a fundamental pillar of net zero electricity systems. For high penetration needs storage or other ways to manage intermittency Assuming net zero lifecycle of panels (manufacture, disposal)	Increasingly to system operators because of falling costs and growing experience	No air pollution End of life panel recycling and material recovery immature	Yes, through community ownership. Some jobs and development opportunities.	Medium to high Likely part of net zero emission world
Small scale and residential PV	Mature	Typically requires subsidies in Canada today	No problems	Yes, but varies with geography. Requires storage and/or grid linkage	Yes. Assuming net zero lifecycle of panels (manufacture, disposal)	Interest from homeowners to reduce utility bills, be independent	Can reduce grid load, useful at peak, highly viable in remote operations with battery storage. Added complexity for grid management. End of life panel recycling and material recovery immature	Yes, for installers, some equipment manufacturers (inverters, racks, control systems). Additional revenue stream for farms, small businesses.	Medium to high. Can be part of low carbon world.

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Building integrated PV	Still emerging for roofs, facades, windows. Mainly at demonstration stage	Still more expensive than comparable building elements	No problem	Yes, but power flows modest compared to current energy requirement of most buildings	Yes. Assuming net zero lifecycle of elements	Interest from architects, designers of net-zero buildings	Reduces demand for power from grid. Helpful in peak periods, or with congested grids	Yes, for companies developing new products.	Medium. Can be part of low carbon world.
Biomass combustion	Mature	Low cost	Potential local opposition to plant siting (trucks and air pollution) and environmental opposition to biomass extraction	Yes. Only viable for smaller scale operations near active biomass extraction due to cost of moving feedstocks	In principle, if biomass is grown in a net zero way. Not practical as a general solution because of limited fuel supply. Competing uses for land and biodiversitypressures. Could be used with CCS to generate negative emissions	For industries with waste biomass.	Can facilitate intermittent renewables. Useful for industrial applications with waste (forest products). Produces air pollution	Local opportunities connected to existing biomass extraction	Low to medium except in specific contexts. Can be part of low carbon world.
Geothermal	Demonstration scale in Canadian context.	Not cost competitive today	No problem today. For some technologies local concern over fracking and seismic activity	Yes, in principle. Continuous baseload power	Yes. Applicable in certain regions. Closed loop systems much preferable	No strong constituency yet, but emerging	No air pollution Some local environmental concerns	Potential development opportunities in Alberta.	High priority for closed loop demonstration and investment
Nuclear conventional	Mature	Relatively expensive. No new builds in Canada for nearly 30 years. Consistent cost overruns.	Doubtful. Strong legacy public opposition to new build nuclear.	Yes, reliable bulk baseload power. But no new conventional reactor designs being developed in Canada.	Yes. Provided lifecycle of mining to decommissioning also decarbonized	Support from existing industry and value chain	No air pollution. Could be source for hydrogen production. Multiple issues: long term waste storage, decommissioning costs, risk of accident, security	Yes. Depending which parts of value chain were in Canada. Nuclear industry currently supports many jobs.	Low today. Highly unlikely given that the industry has moved to SMRs.
Nuclear (SMRs)	Research and development stage	Unclear, too early in development to determine	Strong legacy of public opposition to new build nuclear, offset by nuclear host communities often very supportive of new investment.	If development is successful could provide reliable bulk baseload power. Early markets in remote communities, mine sites, industrial heat etc.	Yes. Assuming decarbonization of fuel production and reactor fabrication.	Strong support from those involved in existing nuclear supply chain	No air pollution. Could be source for hydrogen production. Multiple issues: long term waste storage, risk of accident, security, decommissioning costs.	Yes. Nuclear industry is a large employer. Possible export markets if a successful design is developed. Doubts about Canada's ability to scale up for export	Medium. R&D for now. Too early to identify final potential
Coal with CCS	At large scale demonstration stage	High capital costs. Currently requires significant state support	No organized opposition to CCS today. Some worries about storage permanence. Some opposition to coal and anything that enables its persistence	Yes. Some energy penalty (need to burn more coal for energy for CCS).	In principal yes, with offsets for uncaptured lifecycle emissions (combustion, mining, transport)	Little interest in Canada among coal suppliers and generators.	Air pollution and environmental impacts of coal mining.	Limited. Amine technologies owned by others.	Not a priority. Could be required in some countries. Not needed in Canada because of abundant alternative resources.

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Gas with CCS	At large scale demonstration stage	High capital costs. Currently requires significant state support. Could ultimately be cost competitive with other dispatchable power	No organized opposition to CCS today. Some worries about storage permanence.	Yes. Some energy penalty.	Yes in principle, with offsets for uncaptured lifecycle emissions (combustion, extraction, transport)	Some interest among Canadian gas suppliers and generators.	Can use existing gas infrastructure. Can serve as backup for intermittent renewables. Less storage space required than for coal	Limited unless R&D breakthroughs lead to Canadian technologies	Medium for now. May be used (with offsets) as back up for renewables
Grid and system upgrades									
Inter provincial interties	Mature	Yes. Economics depend on particular project	Active public opposition along route whenever new transmission is proposed	Yes. High voltage DC lines especially useful	Yes. Enabling technology for further deployment of renewables and cost containment	Should be support from exporting jurisdictions. Fraught with political difficulties because of provincial politics	Lowers decarbonization costs. Enhance grid resilience. Revenues to net exporting provinces. Environmental impacts.	Limited: already mature industry	High. Can be part of net zero future and accelerate its arrival
Canada / US interties	Mature	Yes. Economics depend on particular project	Active public opposition along route whenever new transmission is proposed	Yes. High voltage DC lines especially useful. Underwater DC cables where possible	Yes. Enabling technology for further deployment of renewables and cost containment	Many actors see potential gains but building supportive political coalitions on both sides of the border is difficult. Political risks. For some provinces there are decisions about prioritizing interprovincial and US links	Lowers decarbonization costs. Can facilitate decarbonization especially for US side. Enhance grid resilience. Revenues to net exporting provinces. Environmental impacts	Limited: already mature industry	Yes. Can be part of net zero future
Grid improvement	Various levels of development from established to emerging	Various cost structures	No problems with most options as they occur out of sight. Increased power lines may spark opposition	Yes, different upgrades perform different functions	Can contribute to net zero by containing costs, raising efficiency, reliability, resilience Adding more distributed generation sources.	Power companies enthusiastic but worried by who pays	Low electricity costs; more reliable supply, improved power quality, enhanced services	Some local businesses; equipment suppliers	Medium high Necessary facilitating investment
Storage	Various levels of development Pumped hydro: high. Batteries still developing. Hydrogen not yet practical. EV batteries as integrated storage exploratory	Generally expensive. Today only cost competitive in specific contexts: peak shaving, arbitrage, remote locations	Will depend on specific technology.	Yes. But long-term storage of bulk electricity only possible in hydro reservoirs. Pumped storage when terrain allows and used economically. Battery storage dependent on tech breakthroughs.	Important technology for moving to net zero to facilitate deep intermittent renewable penetration.	Seen by most stakeholders as a positive in terms of facilitating intermittent renewables.	Considerable economic benefit to electricity system balancing, reliability, dispatchability.	Future economic opportunities depend on technologies and context.	Medium high needed to facilitate renewables

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Demand management	Many approaches well tested	Often cheaper than adding generation and/or transmission	High. But care must be taken to design and communicate programs	Yes	Yes an essential part of net zero pathways	Companies that design and administer these programs and large electricity users who benefit.	Reduces grid peak loads, lowers energy costs, reduces environmental burdens (through avoided generation).	Limited, although can assist profitability of large end users	High to reduce need for new generation
Energy efficiency	Many approaches well tested	Often cheaper than adding generation and/or transmission	High	Yes	Yes, an essential part of net zero pathways	There are advocates for energy efficiency but often potential is overlooked	Reduces grid peak loads, lowers energy costs, reduces environmental burdens (through avoided generation). Saves money for customers and power providers.	Yes, has largest job multiplier of any energy sector investment, especially in end use sectors such as building retrofits.	High to reduce need for new generation