Power Purchase Agreements

Part II: An overview of contract terms and conditions for Indigenous clean energy project proponents in remote communities

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The Pembina Institute is a national non-partisan think tank that advocates for strong, effective policies to support Canada's clean energy transition. We use our expertise in clean energy analysis, our credibility as a leading authority on clean energy, and our extensive networks to advance realistic climate solutions in Canada.

Acknowledgements

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The Pembina Institute recognizes that the work we steward and those we serve span the lands of many Indigenous peoples. We respectfully acknowledge that our organization is headquartered in the traditional territories of Treaty 7, comprising the Blackfoot Confederacy (Siksika, Piikani and Kainai Nations); the Stoney Nakoda Nations (Goodstoney, Chiniki and Bearspaw First Nations); and Tsuut'ina Nation. These lands are also home to the Otipemisiwak Métis Government (Districts 5 and 6).

These acknowledgements are part of the start of a journey of several generations. We share them in the spirit of truth, justice and reconciliation, and to contribute to a more equitable and inclusive future for all.

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Introduction

In remote communities, independent power producers (IPPs) are proposing projects that would supply their communities with clean energy and achieve Indigenous-led visions of change. While there have been many successful Indigenous IPPs, the power purchase agreement (PPA) process can present a significant challenge to proponents in achieving a positive outcome for their project.

We have developed a two-part series to help address this challenge. Part one covers the basics of PPAs, introduces the project development process and timelines, and advises on how to prepare for the PPA process. In this second part, we delve more in-depth into PPAs, providing key definitions and exploring contract terms and conditions for a clearer understanding of the process.

This series provides general guidance only. We strongly encourage IPPs to seek appropriate legal counsel to navigate their energy and regulatory landscape, including during the PPA process.

Contract terms and conditions

The terms and conditions of the PPA are set out in clauses. These clauses can vary significantly in complexity depending on factors such as the proposed technology, the regulations under which the utility operates, and the policy landscape. In this section, we offer a broad overview of three categories of clauses: standard clauses, non-financial clauses and financial clauses.

Standard clauses

Standard clauses are generally well designed and relatively accessible, as such, we will not explore these clauses in great detail. We have, however, provided in Table 1 basic descriptions of the standard clauses to support you as you begin to develop your PPA alongside the utility.

Table 1. Standard clauses

Clause	Description
Access rights to generation site and/or access to generation data	States the obligations to allow the utility access to the generating facility and/or to specific generation data during operation to ensure expected integration of the electricity.
Breach, cure and default	Establishes implications under these circumstances.
Contract length	Stipulates the length of the contract, generally 20–25 years. Standard practice is to match the contract length with the life of the equipment. For hydro projects that have a longer operational lifespan, contract lengths could still be equal to equipment life (50 years). At a minimum, contract length should be sufficient to recoup capital investment costs, after which point the contract could be renegotiated.
Force majeure	Removes liability of the parties to fulfill their PPA obligations in the case of an event that is beyond their control, and sets out notification requirements for such events.
Insurance	Defines the amount of general liability insurance for the IPP facility.
Limitation on liability	Confirms that the IPP is not liable for any extra costs and expenses the utility incurs to provide electricity other than from the IPP plant to utility customers.
Payment terms	Sets out the frequency and method of electricity payments.
Reporting requirements	Lays out the obligations to provide the utility with status reports before the commercial operation date (COD) and with financial and operating statements throughout the term of the PPA.

Clause	Description
Revenue metering equipment	Establishes responsibilities for paying for and maintaining metering equipment.
Termination	Sets out termination of the agreement in the event of one of the following: • Other party is bankrupt. • Payment is not made after a set time, e.g., 60 days. • Other party is in material default of obligations under the PPA. • Terms of the interconnection agreement are breached.

Non-financial clauses

In this section, we focus on clauses typical in PPAs that are not directly related to revenue but that we've seen to be significant areas of negotiation. Specifically, we outline priority terms and conditions relating to operating requirements and curtailment and disconnection. How the terms and conditions are set out is generally determined by the size of the project.

Curtailment, disconnection, and the dispatch strategy

Curtailment

Curtailment is when the utility limits the amount of renewable energy it accepts even if more energy is available from the IPP's facility. Ensuring diesel generator efficiency is one reason for curtailment. For example, let's say the community has an electricity demand of 10 kW at any given time. The community's renewable energy project is, at that time, generating 8 kW of electricity, and thus the community could hypothetically be powered by 80% renewable energy. However, if the diesel generators need to put out at least 7 kW of electricity to run efficiently, then the utility will only accept 3 kW of renewable electricity, curtailing the amount of renewable energy to 30%.

Your PPA contract and/or other supporting documents should be explicit about when the utility can curtail or disconnect the electricity generated from your facility. In other words, it needs to be clear when the utility is permitted to stop buying the energy coming from your project, even if it is available for purchase.

Disconnection should only occur when the project poses a threat to the utility's microgrid safety and reliability, and both disconnection and curtailment should be minimized to lower your risk.

For example, a clause may stipulate that if the utility disconnects your project for more than a set number of days per year, financial compensation is required in the event the disconnection is the fault of the utility. Without this assurance, confidence in revenue streams and the availability of bank financing for your project may be affected.

If you are creating a **smaller project** (under 20% renewable energy penetration[1]), the terms for curtailment and disconnection are often defined within the PPA itself. Conditions for curtailment or disconnection may include the following:

- The power quality (frequency and voltage) does not meet what was stipulated in the PPA.
- The power quality is negatively affecting the utility's customers or its system operations, risking grid instability or a community black out.
- The IPP is in breach of the PPA by failing to honour contract clauses.
- There is a planned or unplanned outage, constraint or curtailment of any transmission, distribution, substation, protection, control, or communication facility in the system.

If you are creating a **medium-** to **large-sized project** (≥20% renewable energy penetration), specific conditions may not be defined in the PPA. In these situations, the utility will likely have full control over the dispatch of energy from the IPP into the microgrid, following the dispatch strategy.

Dispatch strategy

The dispatch strategy, also known as dispatch protocol or interconnection operating agreement, provides instructions for how the diesel, renewables, battery and load work together. This document is developed with the support of the IPP's engineering team and is negotiated and agreed upon between the utility and IPP.[2] The dispatch strategy dictates decisions related to system operation and provides instructions to the microgrid controller.

The strategy is a crucial aspect of project design and can impact project outcomes and revenue to the IPP. To maximize IPP project benefits, the dispatch strategy should aim to optimize and maximize delivered energy from the renewable energy system while not impacting grid stability or safety. When making the dispatch strategy, the IPP and utility

[1] The penetration level is "the amount of energy that comes from renewable sources in a hybrid microgrid." Dave Lovekin and Dylan Heerema. "Remote communities meet renewable energy solutions," *Pembina Institute*, January 28, 2019. https://www.pembina.org/blog/remote-energy-challenges

[2] Generally, the IPP, and not the utility, starts the development of the dispatch strategy. However, that is not always the case.

could specifically agree that the utility will maximize reductions to diesel generation except when it may impact grid stability or safety.

Having a dispatch strategy rather than defined terms for disconnection and curtailment within the PPA allows for contract flexibility. If changes need to be made to operating principles, revisions to the dispatch strategy are much easier done than changes to the PPA. This adaptability is especially important if another IPP project is integrated on the same grid; decisions will need to be made on how the different IPP projects interact with one another on the grid.

Financial clauses

This section describes key elements of financial clauses relating to project revenue. These include the actual energy purchase rate ($/kWh), take-or-pay, environmental attributes, and battery ancillary services.

Determining the purchase rate ($/kWh)

The rate at which the utility purchases energy is a primary component of project feasibility. Regulatory constraints on what can and cannot be included in PPA rates ultimately determine what rate a utility can support.[3] Under current regulatory practices, utilities must demonstrate that their costs and associated electricity rates are non-discriminatory and fair to consumers. As such, utilities are required to ensure that entering into a PPA with an IPP does not result in higher costs for supplying electricity.

In addition, utilities and electricity regulators are subject to their mandates and are not mandated to consider social impacts, climate targets or Indigenous reconciliation in their decision-making process. This further restricts the ability of utilities and regulators to agree to or approve rates beyond the avoided cost of diesel, issues that are explored in greater detail in *Transforming the Utility Business Model*.[4]

When developing your PPA with the utility, it helps to be aware of not only the constraints around rates faced by the utility but also the different approaches to establishing the purchase

[3] Arthur Bledsoe and Katarina Savic, *Reexamining Rates for Remote Renewable Energy* (Pembina Institute, 2023), 5. https://www.pembina.org/pub/reexamining-rates-remote-renewable-energy

[4] Emily He, Grace Brown and Dave Lovekin (Pembina Institute, 2022). https://www.pembina.org/reports/transforming-the-utility-business-model.pdf

rate. This rate can generally be classified as meeting the avoided, long-term avoided, or true costs of diesel (see the figure below).

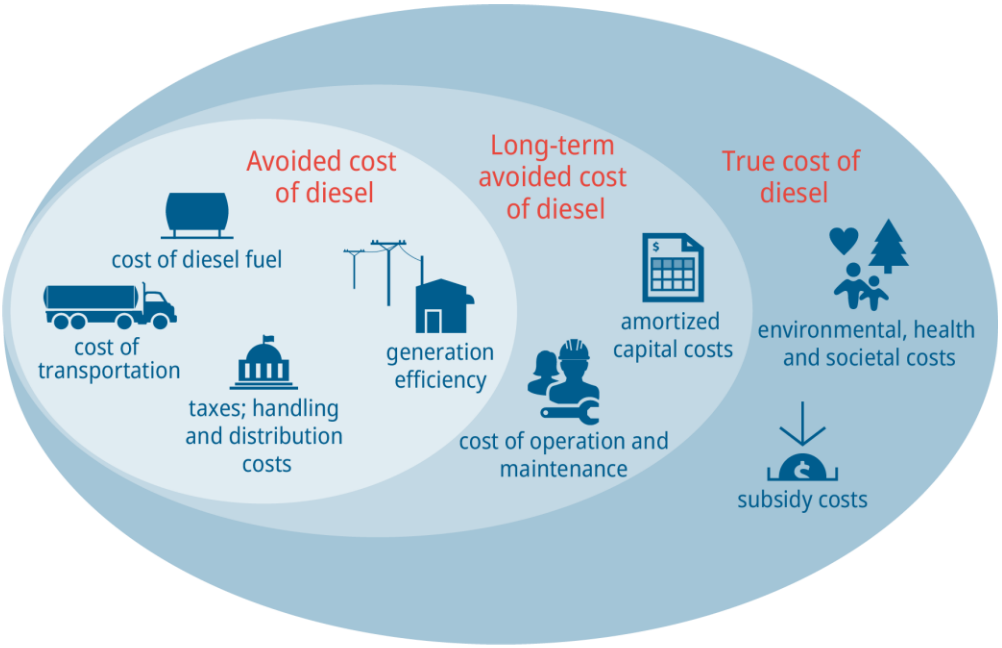


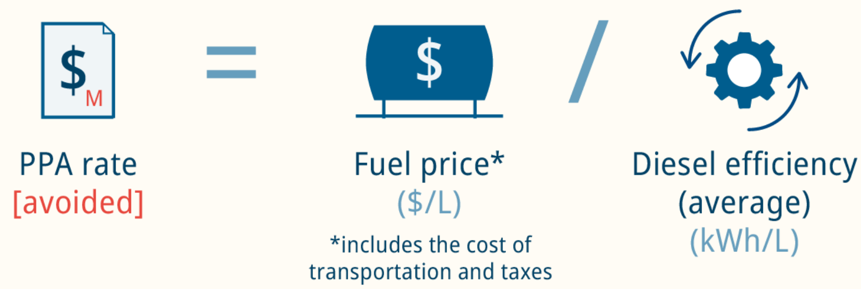
Figure 1. Costs of diesel

In brief, the avoided cost of diesel is equivalent to the direct savings that come from replacing diesel generation with renewable energy. Offering a rate based on this is common practice for most utilities (see Table 2 in the "Navigating your jurisdiction" section). Whether the utility is willing to provide a higher purchase rate reflecting the long-term avoided or true costs will depend on the attitude of the utility, precedents and, most crucially, the jurisdiction's regulatory framework.

We provided further details on each approach below.

Avoided cost

Currently, the model most used by utilities. Usually the PPA rate offered equals the avoided cost of diesel. However, some utilities offer rates below the avoided cost, which is not favourable to the IPP. Rates should be accurate and reflect full project benefits. Avoided cost calculations generally follow this formula:



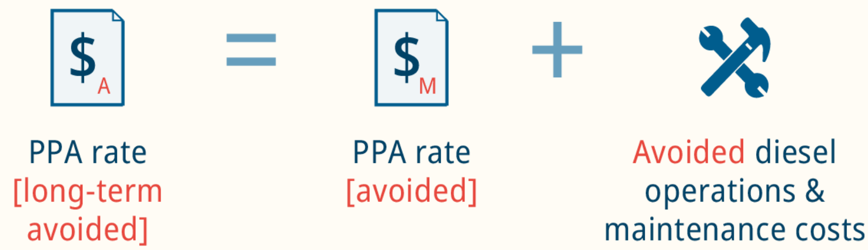
The rate should reflect actual costs specific to the project's community rather than average costs across the utility's service area. The utility should be open to sharing these costs and their calculations during rate negotiations.

In some instances, the PPA rate is lower than the avoided cost due to the utility incorporating the amortized costs of integrating the IPP facility, such as costs for substation upgrades or the addition of a battery. Alternatively, these costs could be paid upfront by the proponent. Regardless, project developers must be aware of these costs as additional project expenses.

Long-term avoided cost

Costs for operating and maintaining the diesel system can be avoided by high penetration projects that enable one or more diesel generators to be turned off for extended periods of time (commonly referred to as "diesel off"). Diesel generator operating costs (including engine overhauls and routine maintenance) depend on operating hours, so reducing these hours reduces the operating costs. Other factors that contribute to diesel operating costs include engine efficiency and frequency of engine restarts — both of which can be affected by renewables integration. Negative impacts can be limited by a well-designed microgrid control system and a smart dispatch strategy. Without a proper microgrid controller design, integrating renewables can increase operating costs, highlighting the need to thoroughly optimize system performance to maximize diesel reduction and thereby long-term avoided costs.

Calculating the long-term avoided cost:



In addition to avoided operations and maintenance costs, another significant offset cost that may be considered is the avoided capital cost of a new diesel generator ("amortized capital costs" in Figure 1). Integrating renewables could potentially push back the installation of a new generator by prolonging the lifespan of the existing generators.

Calculating long-term avoided costs can be complex and requires very detailed analysis to confirm exact savings. In some instances, long-term avoided costs are evaluated after the IPP's facility has been operating for several years by comparing diesel operations and maintenance costs before renewables came online and after. Under this approach, contracts would need to include clauses on updating price structures once these savings are known.

True cost

The true cost of energy is the hardest to quantify, but some PPAs have terms to reflect it. For example, incorporating the effects of carbon pricing in a PPA can capture the emissions and social impacts of diesel fuels.

Electricity generation in remote communities is currently exempt from the carbon price. A utility, however, may choose to adopt a shadow price on carbon, incorporating the carbon price in investment decisions. The PPA rate could then include an equivalent carbon tax payment for the avoided diesel generation. For example, with the carbon tax at $80/tonne CO_2e in 2024, this would represent a roughly $0.02/kWh increase in price; and at $170/tonne CO_2e in 2030, an extra $0.04/kWh.

An IPP should be aware of relevant policies and commitments from the government and the utility when justifying and negotiating for higher PPA rates. If the project helps achieve commitments around greenhouse gas or diesel reductions, or Indigenous economic development, this should be factored into negotiations and represented in the PPA rate.

Achieving higher purchase rates is not about artificially inflating project benefits, but rather ensuring that project revenues accurately reflect full project benefits.

Rate fluctuations

Another item to consider when determining project revenue is how the PPA rate will fluctuate throughout the contract life, which is important given inflation and changing diesel prices. There are two common methods:

- PPA rate tied to the Consumer Price Index (CPI): The full or part of the CPI is used to increase the base PPA rate. For example:

  New price = Old base price × [1 + CPI × a certain percentage]

  It is both preferred and more accurate that the full CPI be used; however, some jurisdictions have historically only escalated rates by a portion of the CPI. This is an unfair practice that results in renewable energy projects having a less favourable business case.

- PPA rate recalculated based on actual fuel prices: The rate would be recalculated over set time frames following the formula for marginal PPA rates based on actual average costs of fuel over a certain time period (generally one or several years). This can be especially important when carbon taxes are included in the fuel cost as these are expected to increase rapidly in the coming years.

Both of these methods are regularly used. Selecting which one to use depends on the circumstances of the project and the preferences of the IPP and utility.

Take-or-pay

Take-or-pay can refer to any clause that requires the utility to either

- buy (**take**) the produced energy from your project, or
- **pay** for the energy even if it is unable to accept the amount of energy agreed to.[5]

The exact way take-or-pay is incorporated into PPAs varies significantly. There is no standard clause that can be followed. Take-or-pay needs to be tailored to the specific project circumstances. For example, payments could be based on agreed-upon requirements for

[5] Reasons why this might occur are the energy demand is too low, there is a problem on the utility side, or the project has been curtailed or disconnected due to other circumstances.

minimum and maximum amounts of delivered energy, reflecting projected demand throughout the year.[6]

From the IPP's point of view, take-or-pay may be essential for securing bank financing. However, utilities may not be receptive to offering these assurances. Negotiating for take-or-pay may require establishing a win-win scenario that clearly outlines how including such clauses would also benefit the utility. For example, the IPP could be willing to be more flexible on other aspects of the contract in exchange for some inclusion of take-or-pay, or specifying that the IPP also faces the corresponding take-or-pay implications (for instance, if there are caps on payments under predefined maximum energy delivery limits).

Additional revenue streams

Beyond the PPA rate based on the cost of energy, project revenue can also reflect the value of environmental attributes or ancillary services. Ideally, an IPP policy, if there is one, should explicitly state how these additional revenue streams may be incorporated into the PPA rate. Historically, however, these aspects are either often overlooked in the negotiation process or the benefits do not flow to project proponents.

For project proponents to be well equipped to raise these benefits during the negotiation process and potentially have them reflected in the PPA requires the proponents to assess the value of environmental attributes or ancillary services based on market value, avoided utility costs and, if it exists, what has been established in other PPAs.

Environmental attributes

Each MWh of electricity generated from a project also generates one associated environmental attribute.[7] Environmental attributes include renewable energy credits (RECs), carbon credits and offsets — each are products an IPP can potentially sell to increase project revenue. Environmental attributes enable the positive environmental impacts of the project to be tracked and govern who can "claim" consumption of renewable electricity.

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[6] In the case of minimum amounts, the utility will take a minimum amount of the generated electricity and pay for at least that much. In the case of maximum amounts, the utility will take and pay for a maximum amount of generated electricity. Anything above that, the utility will not accept or pay for.

[7] An environmental attribute "describe[s] the environmental benefit associated with a renewable energy project. Each megawatt hour (MWh) of electricity generated from a renewable energy project generates an associated EA (1 MWh worth)." Business Renewables Centre Canada, *Renewable Energy Glossary* (2024), 6. https://businessrenewables.ca/sites/default/files/2024-02/BRC%20Glossary%20Design_Feb2024.pdf

Many existing PPAs specify that environmental attributes are transferred to the utility at no additional cost. In some instances, environmental attributes have been transferred to provincial or territorial governments as part of funding conditions. Utilities and government retain environmental attributes such that project greenhouse gas benefits can be attributed to the local grid rather than being sold. Regardless, environmental attributes should be either paid for by the utility above and beyond the marginal PPA rate or should remain the property of the project proponent for use or sale.

Ancillary services & battery ownership

Ancillary services, such as black start and frequency control capabilities, are functions of the IPP project that can facilitate and support the continuous flow of electricity and may be used to maintain grid stability and security. Ancillary services are generally provided by the battery, given one is included in the project, and owned by the IPP. Like with environmental attributes, PPAs in remote communities have historically not reflected the additional benefit of ancillary services; however, these should also be paid for by the utility above and beyond the marginal PPA rate.

Battery ownership by the IPP or by the utility is an emerging area for renewable energy development in remote communities. IPPs may want to retain ownership of the battery system if they paid for the initial infrastructure costs, while utilities prefer ownership to mitigate risks to grid operations.

Ownership may also introduce uncertainties around the replacement of the battery once it is at end of life. If the IPP owns the battery, it may be difficult to guarantee that funding is available to replace the battery as necessary. If the utility owns the battery, replacement costs would be recovered through utility revenues.

Battery ownership is complicated and requires thorough discussions between the IPP and utility to ensure that the ownership, use and replacement of the battery benefit both parties and those benefits are accurately reflected in the PPA.

Another aspect to consider on batteries is that banks are often hesitant to back a project when the project's financial viability hinges heavily on the battery performing as predicted. Uncertainties may exist with the battery's storage performance over its lifespan and with optimizing battery operations and maintenance to ensure that battery functionality is not degraded. Performance issues leading to lower energy outputs can result in decreased revenue for the proponent, and consequently higher financing risks for banks.

Navigating your jurisdiction

A utility's attitude toward the PPA clauses described above depends on the legislation and regulations in place, the utility's prior experience with PPAs, and any precedents set by PPAs currently in place. These elements are all important to know going into PPA discussions. Table 2 provides an overview of precedents with the PPA clauses by jurisdiction.

Table 2. Jurisdictional scan of the precedents of select clauses in PPAs

Jurisdiction		Precedent for…			
		PPA rate at least avoided cost of diesel	PPA rate above avoided cost of diesel	Take-or-pay	Proponent retaining environmental attributes
Provinces	BC	Meets the criteria	Does not meet the criteria	Somewhat meets the criteria	Meets the criteria
	AB	Does not meet the criteria [a]	Does not meet the criteria	Does not meet the criteria	Does not meet the criteria
	SK	Unknown	Unknown	Unknown	Unknown
	MB	Meets the criteria	Does not meet the criteria	Does not meet the criteria	Somewhat meets the criteria
	ON	Meets the criteria	Does not meet the criteria	Does not meet the criteria	Unknown
	QC	Meets the criteria [b]	Does not meet the criteria	Meets the criteria	Does not meet the criteria
	NL	Does not meet the criteria [c]	Does not meet the criteria	Does not meet the criteria	Meets the criteria
Territories	YT	Meets the criteria	Meets the criteria [d]	Meets the criteria	Does not meet the criteria
	NT	Meets the criteria	Somewhat meets the criteria	Does not meet the criteria	Meets the criteria
	NU	Somewhat meets the criteria	Does not meet the criteria	Does not meet the criteria	Does not meet the criteria

Legend: Meets the criteria; Somewhat meets the criteria; Does not meet the criteria; Unknown

[a] Under Alberta's Small Scale Generation Regulation, power producers are paid the pool (market) price for electricity.

[b] Hydro Quebec has subtracted any utility infrastructure costs to support the IPP project from the PPA rate. In most other jurisdictions this is paid by the proponent upfront, but in Quebec these costs are often distributed over the project's lifespan.

[c] PPA rate less than avoided in order to offset the utility's staff costs for integrating the project.

[d] PPA rates include the avoided cost of fuel and "any reduction in the maintenance, capital or other costs arising from the displacement of thermal generation as a result of the electricity generated by the facility," under section 3(1)(b) of the Direction to the Yukon Utilities Board (Independent Power Production).

However, as utility attitudes and government priorities shift, there is an opportunity to move beyond the status quo, particularly in the jurisdictions (British Columbia and the Northwest Territories) that have legislated the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP).

We developed this two-part series to support Indigenous IPPs at the early stages of their clean energy journey, with an emphasis on the PPA process, which can be especially challenging to navigate. This series was informed by a wide range of stories, perspectives and analyses offered by Indigenous clean energy proponents, other clean energy experts and utilities.

Photo: Green Sun Rising

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