Tahoe Central Sierra Cal FRAME Project

Case Study: Biomass Plant in Ophir, California, a Public-Private Partnership Perspective

Prepared for:

The California Governor's Office of Planning and Research

Prepared by:

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Arbor Energy and Resources Corporation

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1. Introduction and Background

This study is part of the Tahoe Central Sierra (TCS) California Forest Residual Aggregation Market Enhancement (Cal FRAME) Pilot Project (TCS Pilot Project) led by Placer County Water Agency (PCWA) and funded by the Governor's Office of Planning and Research (OPR). The pilot project was conducted pursuant to actions contained in the California Wildfire and Forest Resilience Action Plan[1] (Plan; Forest Management Task Force 2021) to address feedstock barriers to biomass utilization throughout the state. Under the TCS Pilot Project, PCWA is tasked with assessing pathways, which may include the creation of a public entity, to reinforce and facilitate feedstock supply chain logistics for woody biomass gathered from public and private forest lands, utility and transportation corridor vegetation management treatments, and forest thinning projects, and to advance utilization of the excess biomass in environmentally and economically sustainable ways.

PCWA is the primary water resource agency for Placer County, California, with a broad range of responsibilities including water resource planning and management, retail and wholesale supply of drinking water and irrigation water, and production of hydroelectric energy. Among other responsibilities, PCWA is a leader in various watershed stewardship initiatives, with the objective of securing a healthy water supply and reducing risks associated with major wildfires (such as the King Fire in 2014, and the Mosquito Fire in 2022). A map of PCWA's service area and water and power systems is shown in **Figure 1**.

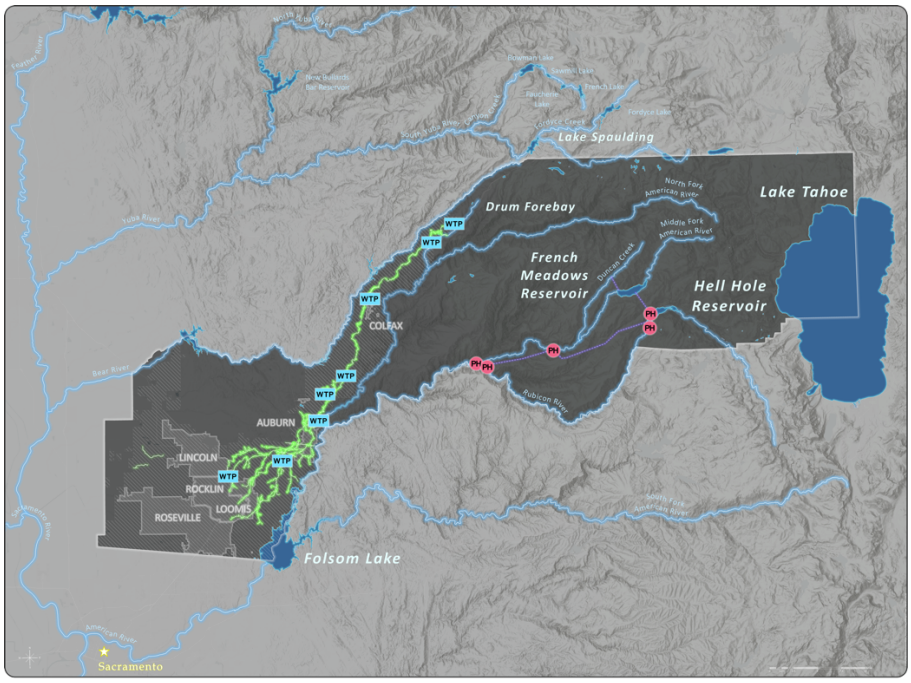

Figure 1. Map of PCWA Service Area, Water Systems, and Power System.

[1] Consistent with the State's Action Plan, "information and templates will be shared broadly to provide a menu of options for broader adoption" (Action 3.10 Address Feedstock Barriers through Pilot Projects; Forest Management Task Force 2021).

In parallel with participation in the TCS Pilot Project, PCWA had been actively engaged in working with Arbor Energy, the developer of a cutting-edge biomass-to-energy conversion project. PCWA has a waterworks site in Ophir that will host the highest energy use within its water system by lifting water 200 feet from an underlying tunnel to ground level, then requiring further energy to treat the water and deliver it to customers. Implementation of this cutting-edge concept would result in a carbon-negative electricity generation facility, with the dual benefits of watershed biomass reduction and stand-alone electrical power for a key PCWA facility.

PCWA's objectives in this project are to effectively utilize biomass for overall benefit to the watershed, energy reliability at a critical waterworks site, and insulation from retail energy prices. Arbor Energy's objectives are innovation and scalability of technology to convert biomass into carbon dioxide (CO2) for geologic sequestration, while also generating energy adequate for their process and offtake, either for their host site or the grid. This Case Study provides perspectives by the PCWA-Arbor partnership on the challenges, opportunities, and feasibility of implementing a public-private partnership biomass project to meet sustainable biomass and energy production objectives.

2. Concept Genesis

PCWA

PCWA's water supplies are derived from the Middle Fork American River and South Fork Yuba River watersheds, with watershed origins at the western crest of the Sierra. Water supplies are collected, stored and transported by a system of reservoirs and canals to users in the western half of Placer County. Roughly three quarters of the county is forested and has experienced a series of devastating wildfires in the past decades. **Figure 2** shows a map of historical fires in the American River watershed over the last 100 years, with the fires in the last century distinguished from this century. The change in fire regime is evidenced in the fact that more than 400,000 acres have burned thus far in the 21st century, as compared to 330,000 in the entire last century.

PCWA operates several pumping and water treatment facilities around its service area. At the Ophir site, PCWA currently operates a major pumping station (current load 1+ megawatts (MW)) and is in the final stages of designing a new water treatment plant that will increase this load to approximately 3 MW. Over the past few years, the local utility (PG&E) has resorted to public safety power shut offs to reduce the potential for electrical system-initiated wildfires. PCWA's pumping and water treatment plant are critical infrastructure, thus backup power is required for these facilities, which is currently provided by diesel generators. PG&E's rates have approximately doubled in recent years and are likely to double again. PCWA would like to develop on site energy generation that mitigates these circumstances for its water customers.

In 2021, PCWA started investigating the potential for a biomass energy facility to be co-located at the Ophir water treatment plant location. The concept behind the investigation would be to a) provide a source of renewable, behind the meter backup power, and b) develop a local demand for excess biomass which could hopefully be extracted from watersheds critical to PCWA operations. By late 2021, PCWA was considering solicitation for a private party biomass to energy project developer to partner with at the Ophir site.

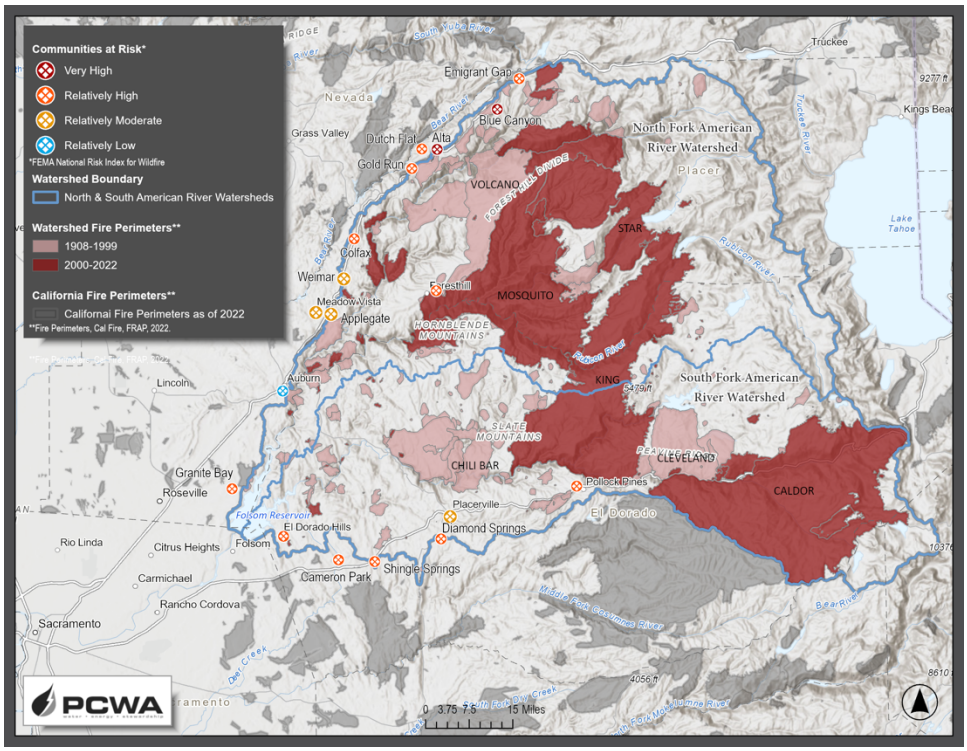

Figure 2. Map of Historical Fires in the American River Watershed.

While researching for a biomass facility at the Ophir location, PCWA had identified several challenges to the concept. Access to a consistent and affordable source of biomass, economies of scale for a biomass facility, and eliminating the pollution normally associated with biomass combustion were all challenges that would need to be overcome. For example, PCWA's research showed that business entities that routinely handled or produced biomass (e.g., a lumber mill or a landfill that accepted green waste) had more ready access to biomass supply, often at low or no cost, than an independent biomass utilizing project. In addition, PCWA undertook pro-forma financial analysis for a generic biomass facility, which utilized behind-the meter load, heat rate (biomass to MW conversion rates), facility capital and O&M cost, and cost of biomass as primary variables. PCWA's analysis showed that very low (or zero) biomass costs would be necessary for a viable alternative to PG&E power rates. These challenges translated to risk for a biomass to energy concept for the Ophir site - and not necessarily the type of risk appropriate for a public agency to accept.

In 2022, PCWA was fortunate on two fronts. They had the opportunity to apply for an OPR grant which became this TCS Pilot Project. The work conducted pursuant to that grant has both further documented the substantial challenges with biomass sourcing and utilization in TCS region, as well as developed concepts for addressing or resolving a number of those challenges. The work conducted as part of the TCS Pilot Project is presented elsewhere in the grant reports.

Also in 2022, PCWA was approached by a biomass to energy technology company that was pursuing a novel and potentially game changing technological breakthrough. In addition to a 'typical' biomass to

energy project concept that turns biomass into electrical energy and heat, the new technology being developed would also allow the capture and sequestration of substantial amounts of pure CO2. The entire process, biomass in and electricity and carbon dioxide out, would be carbon negative. In addition, the captured CO2 was a byproduct with commercial value in the form of carbon credits.

Arbor Energy

Arbor Energy and Resources Corporation (Arbor or Arbor Energy) is a private startup based in Los Angeles looking to leverage advanced aerospace engineering principles to create a next-generation biomass to power system and facility. Arbor's system utilizes high pressure gasification, oxy-combustion, and supercritical CO2 turbomachinery to convert low-grade heterogenous biomass into electrical power while capturing the associated CO2 emissions. This CO2 would be transported by truck or pipeline to the central valley, where it would be sequestered into geologic formation through a Class VI well, permitted by the US Environmental Protection Agency. In addition, the process generates a stream of freshwater, and has no point source criteria emissions, as there are no gaseous effluent streams. A process concept of Arbor's proposal is shown in **Figure 3**. From 2022 to mid 2024, Arbor was working with PCWA on a demonstration of this technology at their Ophir site, which would have provided behind the meter power to PCWA's operations while utilizing biomass created from sustainable forestry operations in the region. Through this process, the Arbor team tested their thesis about this novel biomass to power pathway, and learned many valuable lessons that they would like to catalogue.

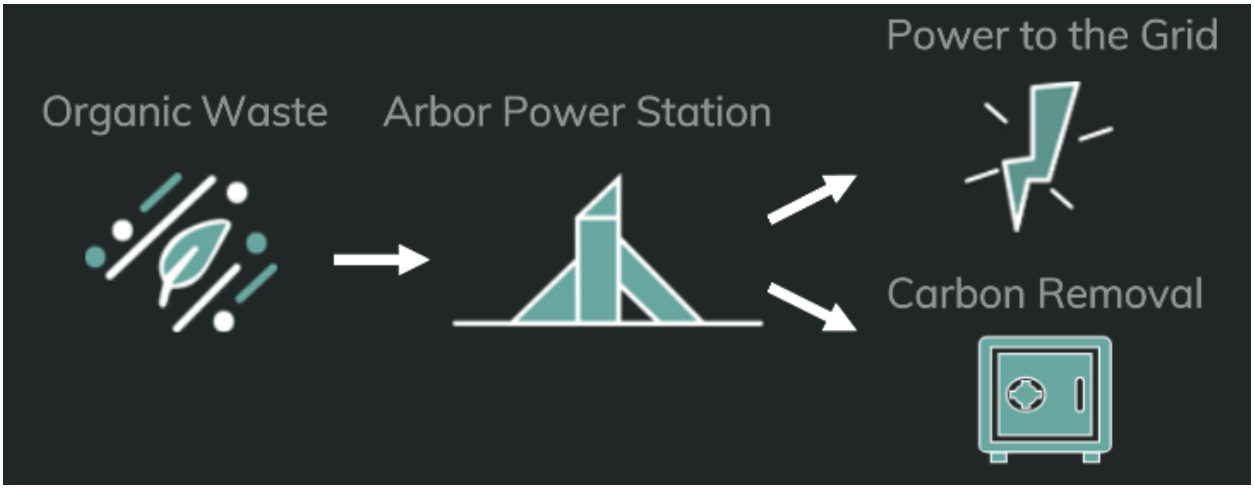

Figure 3. Arbor's Concept for Utilizing Forest Waste, Clean Energy, and Carbon Sequestration

Arbor's founding was a response to growing wildfire problem in the State of California. This problem stems from growing fuel loading in the forests of the state. In the past, much of this fuel would be managed through timber projects, while biomass residues would be mobilized to conventional biomass facilities. However, with sawmills closing up and down the state, biomass is now most often stranded, as the economics of forestry management solely for a source of biomass to turn to electrical power cannot be justified for private companies. Biomass is not a great carrier of energy, with its low energy density and inherent moisture content. These factors have led to a lack of funding forestry treatment across the state, increasing wildfire risk. As a result, California has been looking for solutions to convert biomass into higher value products, such as hydrogen, biochar, and liquid fuels. By doing so, more money can flow upstream

to forest management activities, allowing purchasers to pay more for biomass, allowing more land to get treated. Arbor's technology is premised on the fact that the best use case for this biomass is actually to focus on the carbon inherent in this fuels management biproduct. Again, biomass is a poor carrier of energy, however, it is a fantastic carrier of carbon. Since this carbon, which is made of CO2 that the plants absorbed from the atmosphere while growing, is biogenic, industrial processes that purify and permanently sequester this carbon are considered carbon negative. In the growing world of the Voluntary Carbon Markets (VCM), these processes are referred to as Biomass Carbon Removal and Storage (BiCRS), or Bioenergy with Carbon Capture and Storage (BECCS) when they produce energy.

When compared to other biomass pathways, Arbor believes utilization for electric power and carbon dioxide removal (CDR) is a best use case for biomass. Conversion of biomass to Hydrogen or liquid fuels are both inefficient processes, fundamentally coming back to the same thermodynamic problem that biomass is a poor carrier of energy. The former also poses logistical questions around how to transport large amounts of hydrogen, which is notoriously difficult to transport, from the Sierra Nevada to the coasts. Biochar pathways are significantly more proven than Arbor's pathway, and are CDR focused, however Arbor hopes that its system will be significantly more scalable than biochar, which struggles from logistical challenges at macro scale. Additionally, Arbor's system would be more efficient on a power production standpoint and a carbon conversion standpoint per ton of used biomass than biochar.

When compared to other carbon removal pathways, Arbor believes that its process can be significantly more economic and durable. CDR has two overarching categories: 1) nature-based solutions, and 2) engineered solutions. Nature based solutions, such as planting trees, increasing soil carbon, or spreading mangroves, are cheap and scalable, however in recent years have come under attack as the removals they claim are hard to confirm and may not be permanent. Engineered pathways have the opposite profile: geologic storage of CO2 is incredibly durable and easy to measure, although a life cycle assessment of any project is necessary to make deductions for fossil emissions associated with the project. however, it is also currently expensive. While both forms of removals will be necessary to get to a zero-carbon future, Arbor specifically chose an engineered carbon removal pathway. Other engineered pathways such as Direct Air Capture (DAC) or Biochar do not create power, in fact, the former consumes a significant amount of power to scrub CO2 directly from the atmosphere. Since carbon and energy are inherently interlinked, there is a good question for the DAC industry around if the power they would use to power their systems would be better purposed on the grid to directly displace fossil fuels instead. Since Arbor's system creates, rather than uses, power, Arbor's projects have vastly more diverse and stronger project economics. Additionally, as a power provider and outlet for waste biomass, Arbor's projects offer more to the community than just jobs. Finally, Arbor's process of oxy-combustion is more technically complex and unproven than traditional BECCS (fluidized bed boiler with a solvent/sorbent/amine system). However, at scale Arbor's system will be significantly cheaper, faster to deploy, and more efficient. Taken all together, Arbor is cheaper than other engineered carbon removal pathways, while being significantly more durable than nature-based carbon removal pathways.

Finally, when compared to other renewable power systems, Arbor also has several distinct advantages. Similar to how Arbor is unique among CDR offerings in that it can generate power, it is unique among renewable power offerings as it can generate CDR. Other forms of renewable power are carbon neutral, not strongly carbon negative. Additionally, Arbor systems are fundamentally gas turbines, meaning they can provide power 24/7 and can respond to grid power challenges. In fact, by having more baseload and

responsive power systems on the grid, operators can also put more intermittent sources of power on the grid (such as solar) and still be stable. As a result, Arbor's system could be key sources of backup power that would allow further decarbonization.

However, Arbors solution does have some challenges, which were acutely felt as the team tried to push forward in project progress. First and foremost, Arbor's full technology stack is unproven. While the subcomponents of the system each have been demonstrated in their respective industries and applications, the combined process has not. As a result, Arbor struggled against the same challenges facing many developers of new hardware. Principal among these is what is referred to as the "funding valley of death," where many hardware startups struggle to find funding for developing their technology since it hasn't been proven. Given that proving the technology requires funding, this can often become a self-referential problem. Government support of development and projects via grants is often seen as a remedy to this, however many government programs in the forestry space are for smaller projects or more proven technologies. Additionally, BECCS as a carbon removal option gets significantly less focus than other carbon removal pathways, making funding opportunities through the federal Department of Energy less common. The other large challenge that Arbor had to deal with pertained to the novel carbon markets that underlie Arbor's business case. As mentioned, these markets are new, and many projects in them are very small scale. Arbor's system benefits substantially from economies of scale, due to the core technologies chosen gasification and turbomachinery can only be done feasibly for systems 3 MW and larger. A system of that size would capture 50,000-60,000 tons of carbon removal a year. Considering VCM carbon prices range from $300-$500/ton, and Arbor would need at least 10 years of offtake to finance a project, that would require Arbor to close on offtake deals of up to $300 million, an immense sum for an unproven technology with no track record. Many CDR deals are still very small, built technologies that may produce higher priced carbon, but can do so at much more modest scales. Despite Arbor's ability to offer cheaper CDR than its competitors, the total value of the contracts needed limited potential customers significantly. The CDR market's nascency also proved to be challenging in more concrete ways: the lack of the required infrastructure. For Arbor to complete the process that generates CDR credits, it is required to put the CO2 it captures into Class VI wells. Currently, there are no operating class VI wells in California, with a handful under development. Those under development are under a large amount of scrutiny - as will be discussed in later sections - that materially threaten the chances that they are built and come under operations in time. CDR customers are intensely aware of this fact, and one of their key considerations on deals, after price of credits, is the likelihood of delivery. Without being able to assuage concerns that these wells would come online in time, Arbor had great difficulty in attracting customer interest. The lack of existing infrastructure, and potential challenges to the infrastructure being built, present clear hurdles to any company in California attempting to sequester carbon through geologic means. For primarily that final reason, Arbor has made the decision to move its commercial demonstration to the American southeast. However, Arbor still sees a huge amount of potential in California and would be thrilled to continue projects there to help address the wildfire and renewable energy challenges of the state. Arbor believes biomass, no matter the pathway, has an important role to play in the future of California's economy, and hopes others can learn from the lessons here.

3. Lessons Learned

PCWA and Arbor offer several important lessons learned from the process to date:

1. **In utilizing novel technologies and leveraging undeveloped markets, a private partner is essential.** Legal requirements and political expectations constrain public agencies from taking undue risk. As a public agency, PCWA is expected to provide reliable public services, that must fit within its statutory obligations, at a reasonable cost and minimal risk. These constraints prohibit them from independently developing a project that speculates on an undeveloped commodity market. Where PCWA could have developed a conventional biomass energy plant, they found that such a project did not pencil out, even when compared to costly PG&E rates. This financial reality necessitates a secondary revenue stream for project success. Since many high value use cases for biomass (CO2, hydrogen, bio-char, manufacturing) are reliant on new technologies or markets that have yet to be proven, a private partner is essential to take on the risk and reward of pursuit.

2. **For public agencies, it takes time to find and develop a working relationship with the right private partner**. As a public agency, PCWA has a variety of constituents and stakeholders that may not be typical for a private sector business entity. An elected Board of Directors, a core mission (water supply) that cannot be disrupted, a modest to low appetite for risk, and a large base of ratepaying stakeholders all need to be considered in any business decisions by a public water agency. The private sector partner will have its own drivers, including investors, cash flow, and other success metrics that require it to have confidence in its public partner. PCWA invested considerable time in becoming acquainted with Arbor and continued to exchange information on a regular basis so both the public and private parties are confident with continued investment.

3. **For private companies, finding a public agency with aligned vision, goals, and risk appetite is key.** Public partnerships are key to a project's success, especially when a company is new or entering a new geography for the first time. Public partnerships are central to establishing community and regulatory support; however, public entities vary in size, scope, and risk profile just as much as their private counterparts. Ensuring the private and public entities in a partnership are completely aligned helps significantly in navigating these processes and avoids potential project-derailing disagreements later in the project's life. Creating a stakeholder map is an important early-project activity that can help developers identify public entities in a community and begin to strategize on which they want to keep engaged, which they want to keep informed, and which they want to partner with. This exercise can also help feed into a greater community benefits plan.

4. **Community relations are essential.** Both PCWA and Arbor have completed extensive public outreach, both jurisdictional public entities (Placer County and the Placer County Air Resources Board), and with the community. A discretionary project like this, even with its potential reliability and cost benefits, cannot be successful without assuring that community interests are considered and reasonably addressed. Arbor has invested significant effort to ensure a local, capable workforce. These obligations are not only essential for environmental review of the project, but also for political reasons and for being competitive for grants. The California Environmental Quality Act (CEQA) gives communities significant input on project development, even in projects outside city limits in industrially zoned land. Their concerns are many: traffic from potential fuel trucks, air and water

concerns, aesthetics, job creation, how the facility will affect the character of the community, or even if projects like this should be in the community at all. At times, concerns will be counter to one another, or could be seen as arbitrary, however, these concerns are still valid, coming from citizens that care deeply about their communities. As a project developer, one starts naturally in a trust deficit, and it is incredibly important to build creditability early on so that future community engagement efforts are recognized as sincere. Another important skill is identifying what stakeholder groups in the community to engage and how. Many of these groups simply want to be kept in the loop and can be very easy to accommodate and bring on as project champions. Some stakeholders will always be opposed to the project being built for reasons that transcend the individual project being proposed. Navigating this is much easier said than done and is made significantly easier by working with public entities within the communities.

5. **Labor supply is a key regional challenge across the value chain, and this challenge is expected to become more severe.** Biomass supply, and therefore the projects that will rely on it, are geographically distant from the core of California's industrial base. This means that local operators, engineering firms, and regulatory agencies in the eastern Sierra Nevada have little experience in these types of projects. For operators, this means that project developers will have to invest time and resources in local training programs with community colleges and workforce development groups. In discussions with local engineering, procurement, and construction firms, it was clear few had the experience and capability on heavy industry project like this, creating tension between hiring locally and hiring experienced project partners. Finally, despite their eager support, permitting agencies and regulators did not have the tools to give clear guidance to project developers on how they can navigate the permitting process, increasing overall project risk. In addition to this, the upstream labor supply of foresters to do the actual work that creates this biomass is under severe strain, as a lack of economic opportunity paired with rising costs threatens the workforce of the industry, which is on the cusp of losing a huge amount of institutional knowledge as this generation of foresters retire.

6. **For projects requiring grid interconnection, start early and work between the public-private partnership and the utility.** PCWA has invested in updating the electrical design for its forthcoming water treatment plant, to include provisions for a flexible biomass interconnection to the grid. The biomass facility will have the option for both net energy sales to the electrical grid, as well as current and future behind the meter uses by PCWA. It was essential for Arbor to collaborate in this process, from the beginning. Interconnection into grids, especially in California, has increased dramatically in time frame over the past decade, and can now dominate a project's schedule and risk profile. Project level capital cannot be closed on until interconnections are in sight, and even getting to that point can take years of work and hundreds of thousands of dollars of desk work, and potentially millions of dollars of infrastructural upgrades.

7. **Biomass supply is key**. The private partner will need to have a confirmed source of biomass to secure investor funding for the project. Both PCWA and its partner have completed extensive outreach, and preliminary negotiations, with local entities that have access to substantial biomass supplies. Outreach has included local lumber mills, other biomass utilization entities, biomass producers (e.g. forestry companies, right-of-way clearing entities, landowners, and others). In the TCS region, it is widely accepted that there is an abundant supply of biomass; however, long-term contracts are not being

offered due to the vulnerability in any single source of supply, as well as variable costs of harvesting. PCWA and its partner are reasonably confident in securing sufficient and durable biomass contracts; however, there is considerable work to do to consummate those contracts. For infrastructure projects, it is typically standard for debt financiers to expect a developer to have "bankable" contracts in hand covering all required inputs and outputs in the system, before any funding can meaningfully be raised to construct the project. "Bankable" in this context means that the contracts have legally enforceable terms in case of default, e.g. if a project's biomass supplier doesn't provide, or a project's offtake partner doesn't take, the project has legal recourse for damages. These bankable contracts would be expected to be the same term as the debt raised for a project, typically 10-20 years. Long-term biomass contracts practically do not exist, not only in California, but for biomass plants across the country, with most plants working with less than half their volume contracted, and even then, on a basis less than 2-years. Even if a project could get a contract, it would not be long enough, and even if they were somehow able to secure an unprecedented 10-year biomass contract, there would be massive counterparty risk, as the suppliers of this biomass are typically (with notable exceptions) small, family owned logging crews, which will not be seen as under-writable by debt financiers.

8. **The project site must create opportunity for both the public and private partners.** PCWA's project is essentially 'brown field' - developing a new project in a previously developed area. PCWA owns the Ophir site, already has appropriate zoning (industrial), already has the existing electrical interconnection and pump station on-site and is in the process of developing a large (30 million gallon per day) water treatment plant. PCWA briefly considered an alternative 'green field' site in Foresthill (with far less existing infrastructure), but concluded that the existing, partially developed site with energy demand would be a much better fit for a new biomass project. PCWA concluded that the extra time and investment to develop a new site, including zoning, local stakeholder, and behind-the-meter load development considerations, vastly outweighed any constraints that the existing site may have had. In addition, PCWA's total schedule from concept through commissioning for its existing site will likely be 5 years or more; starting with an undeveloped site would potentially add 3 to 5 years to the overall schedule.

9. **There is uncertainty with novel concepts, requiring research and development**. PCWA was fortunate to find a private sector partner that has a technological concept for biomass utilization that will bring a substantial additional revenue stream to the project, once fully mature. However, at this time the technology is still unproven, which will add complications to final design, permitting (e.g. air quality permits), and financing. PCWA has found that this less mature technology, while ultimately more promising, demands additional time and patience in dealing with its partner, with jurisdictional permitting agencies, and with public stakeholders. PCWA was also fortunate in Arbor taking responsibility for its own funding both research and development and implementation. Arbor is funded through venture capital, which is a full-time effort to maintain interest by investors and to successfully renew investment each year during project development.

10. **Public policy and public perception of these projects must be aligned with project goals.** Outside of the forest products industry and the communities in which they operate, modern forestry is incredibly misunderstood. While many of these communities are painfully aware of the threat caused by fuel loading and the steps needed to address wildfire risk, these views can be at odds with the views of many Californians who do not live in these communities. This plays out in the political arena, with

state agencies and communities often in disagreement about the problem, how to address it, and the allocation of resources needed to do so. This tension transcends California, and similar challenges exist at the national level as well. If there is to be success in this arena, governmental support for innovation is needed, and core to that is addressing the misunderstandings about forestry and the role it has in modern society. Without addressing this misunderstanding, programs meant to support these projects may struggle to find success, and project developers will be wary of investing into a project premised on uncertain political standing. Education and alignment are needed across the state to discuss the importance of active forestry management, and the role that heavy industry has in solving these problems. Additionally, many of the novel biomass pathways involve the sequestration of CO2 in geologic storage, often referred to as carbon capture and storage (CCS).

CCS is done in a well specifically designed and permitted for storage, referred to as a Class VI well. Currently, California has no class VI wells in operations, but a handful in development. These wells are politically contentious, at both the state and federal level. While they are a focus of the 2022 California Air Resources Control Board scoping plan, they have met tremendous pushback from communities and non-governmental organizations (NGO), with claims of safety concerns, greenwashing, and being a non-solution. Generally, the NGOs that are against class VI wells are also against active forestry management, so projects that combine the two are particularly at risk. Beyond just the Class VI wells, if California is going to hit its sequestration targets, there will also need to be the construction of CO2 pipelines to move CO2 both from regions with biomass and from California's industrial core to the Central Valley where these wells can be built. These pipelines would be like those already operating in the American southeast and southwest. Pipelines would vastly expand the amount of CO2 that could be sequestered and are a significantly cheaper and safer option than moving the CO2 via truck or rail. Given the challenges of building Class VI wells and traditional pipelines in California, it may be a significant amount of time before these assets get built, further limiting the potential growth of this industry.

4. Conclusions and Takeaways

PCWA can offer a few key conclusions and takeaways from the process it has undertaken to date.

1. **A good SWOT analysis is paramount**. A public agency should complete an honest strengths, weaknesses, opportunities, and threats analysis early in any process that might result in a biomass development effort. PCWA identified its strengths (e.g. ideal site and behind-the-meter load) and weaknesses (e.g. lack of consistent and reliable biomass supply) early in the process, which substantially shaped additional efforts towards defining and pursuing its project.

2. **Find something else to sell**. If ultimately successful, PCWA's private sector partner must substantially change the economics of a biomass to energy project by developing a technology that generates an additional revenue stream. Biomass is not a powerful carrier of energy, so simple conversion to electrical power as traditional biomass projects have, are not economically viable. The ability to sell carbon dioxide offsets could substantially supplement the energy income from the biomass project and will allow additional flexibility particularly in siting and the price paid for raw biomass (which in turn better guarantees the supply of biomass).

3. **Find a viable and reliable partner**. PCWA was fortunate to enter a relationship with a private sector partner with considerable technical and financial sophistication, as well as patience and vision to be able to work through the innumerable challenges that project development has and will bring. Public agencies typically have a very finite appetite for risk and may have limited charter for projects outside of their core mission. Finding a private sector partner that understands both the capabilities and limitations of working with the public agency makes for better relations and more potential for success in the long run.

5. Next Steps, Solicitation of a Request for Qualifications

With Arbor Energy pursuing their first-generation project outside of California, PCWA is re-assessing its objectives against the viability of both existing and novel technologies. These objectives restated are: 1) energy reliability at the Ophir site, 2) insulation from rising energy costs, and 3) effective use of biomass sourced from within the local watersheds.

PCWA plans for the water treatment plant to be online late this decade and hopes for an energy plant to be online within a similar timeframe. To that end, a request for qualifications (RFQ) was issued in first quarter 2025, a copy of which is attached to this report. The RFQ went out to approximately 25 potential biomass technology firms or biomass development entities.

On February 28, 2025, PCWA received two responses to the RFQ. A summary comparison of how those responses addressed PCWA objectives is also attached to this report.

Comparison of Responses **Mar-25**

RFQ for a Wood Waste to Energy Facility at the Placer County Water Agency Ophir Water Treatment Plant Site

Proposer	*Proposer Info*	*Technology*	*Ownership Proposal*	*Financial Proposal*	*Fuel Use*	*Other Notes*
Biogas Energy Opt. 1	Renewable energy project developer	Pyrolysis vaporizer	Biogas Energy proposes to install a pyrolysis biomass facility to generate 3MW Gross, 2.9 MW net, expand as needed in future	Behind the meter only, to achieve CEQA categorical exemption, or	75,000 tons/yr wet	20,000 tons biochar per year production
Biogas Energy Opt. 2	Renewable energy project developer	Pyrolysis vaporizer	Biogas Energy proposes to install a pyrolysis biomass facility to generate 6MW Gross, 5.8 MW net	BTM and export to grid	150,000 tons/yr wet	40,000 tons biochar per year production
	Founded 2008	Products: Pyrolysis gas & biochar		PPA at fixed price, annual escalation at inflation	Biogas Energy will secure feedstock and market the biochar	Need to confirm biomass as wet not BDT
	Project on line at Western Placer Waste Management Authority (waste biomass as fuel)	Pyrolysis gas is combusted to make steam, which drives a steam turbine		Biogas Energy will sell excess to the grid		Biogas Energy will develop the project, securing all permits and licenses, obtaining financing, procuring and installing equipment, and operating the facility
	Project online at Republic Services, Oroville (food waste as fuel)	Modular, compact footprint for equipment		Annual site lease at minimal amount		Biogas Energy finances projects through a combination of debt financing arranged with longstanding development partners, and state and federal incentives.
	Project online at Fiscalini Farms, Modesto (cow manure as fuel)	Can operate in island or microgrid mode				
West Biofuels	Bioenergy technology developer	biomass gasifier/thermal oil heater and organic Rankine cycle generator in procurement for Hat Cr, Williams, Mariposa projects	Typically EPC contractor hired by owner for design, permitting, procure & construct	Typically EPC contractor hired by owner for design, permitting, procure & construct	Est. 28,000 BDT for 3 MW	
	EPC for a ag and forest waste to power project in Woodland, 3 MW net, bioMAT Supplied & constructed turn-key 3 MW net rice hull facility in Williams, BioMAT In construction: Mariposa forest biomass, Hat Creek Project in Burney		Can assist or propose a finance/ownership package, with third party owner can perform O&M		Will need to develop biomass contracts as part of feasibility assessment	