Mr. Bradley Worsley
President
Novo Power, LLC
PO Box 2649
Snowflake, AZ 85937

Biomass Power: A Critical Element of Forest Maintenance

The Story of Novo Power in Snowflake, Arizona

My name is Brad Worsley and I am here on behalf of my family's biomass power facility, Novo Power, located in Snowflake, Arizona. It is my firm belief that biomass power and healthy forests and watersheds go hand-in-hand, and that the benefits of biomass power go far beyond electricity on the grid. Investing in biomass power helps fund badly needed forest and watershed maintenance, saves money for the U.S. Forest Service and taxpayers, and supports local economies. I am going to tell you some of the lessons we have learned through our experience in Arizona – but many of these lessons are directly applicable to federal and private lands across the country.

In the face of massive high intensity forest crown fires, Novo Power has chosen to act. Our story is personal. We built a multi-generational home on a small homestead deep in the Apache-Sitgreaves Forest. In 2002, the Rodeo Chedeski fire changed the landscape around our home for the next several generations. The deep loss we felt led us to educate ourselves on the issues. We learned that the condition of the dense green forests of Northern Arizona are far departed from their historical range. We obtained a census on the Territory of Arizona from the early 1900's and learned that the forest looked very different when the pioneers arrived and began to settle the country. Acreage with 5-15 trees per acre and gaps large enough to drive a covered wagon through, now are made up of dog hair thickets where as many as 2,000 trees per acre fight for the nutrients, sunlight, and water that used to support a tiny fraction of the current tree population. We were saddened by the U.S. Forest Service policies on fire suppression that all but eliminated the natural form of cleansing and forest management. We were irritated by the fighting and ensuing inaction caused by the "timber wars" of the 80's and 90's. We decided that if no one was going to act, we would.

In 2006, we entered Power Purchase Agreements with Salt River Projects (SRP) and Arizona Public Services (APS) to build a 28 megawatt (MW) Biomass facility to assist in the restoration of our National Forests. By June of 2008 we were operational. The first few years were laden with challenges, the most significant of which was the changing debt markets. The economy was about to enter the worst recession since the Great Depression and the Biomass plant came in 1.5 time over projected build budget. In 2010, the bank took the plant into receivership in hopes of running the plant more efficiently. Our family was relegated to the sidelines until an opportunity to repurchase the plant surfaced in early 2013. We were more than willing to finish what we started and we jumped back in with both feet. We had learned so much and were determined to not repeat the mistakes of the past. Since July of 2013, we have profitably run the facility while increasing output by over 10% with uptime levels that rival the best run facilities in the country.

This Novo Power Biomass facility is the keystone of the successful accelerated, industry-funded, landscape-scale restoration of Arizona national forests under the Four Forest Restoration Initiative

(4FRI). Over 90% of all acres thinning under this contract in 2016 was made possible by having the biomass from those acres burned at our facility. The great success of 4FRI to date has been the spirit of collaboration that has brought Industry, Environmentalists, Academia, USFS, and others to the same negotiating table. No one is getting everything they want but everyone is getting most of what they want. What we all realized is that no one won in the catastrophic forest fires that burned through Arizona over the last 20 years. The social consensus between the parties is based on the realization that restoration, starts with the removal of the excess biomass which causes the dangerously high fuel load on the landscape, and that this is impossible to accomplish without a place to dispose of the biomass responsibly and ecologically, such as a biomass facility with controlled emissions. If the forest products industry wanted the small round wood, they would need to find a solution to the removal and disposal of biomass – pre-commercial trees and brush, tree tops, limbs and logging residues that have little or no value other than as fuel. These materials, also known as "high hazard fuel" to foresters, increase exponentially the risk of catastrophic wildfire if not removed from the landscape. This is the reason why best available science forest restoration, such as implemented under the 4FRI project, requires the removal of biomass during mechanical thinning treatments. We support this position and believe that science, as well as common sense support it as well. Consequently, two of the challenges of forest restoration in Arizona, are that biomass represents more than 50% of the woody mass that must be removed from every acre treated with mechanical thinning, and that there are very few utilization opportunities for biomass that are economically viable enough to fund the restoration treatments. Therefore, biomass removal and utilization become a limiting factor on the implementation of restoration. We affectionately call this the biomass bottleneck.

To date, almost all acres thinned in the 4FRI area have been made possible by bringing the low value biomass to our facility to be burned. The challenge is twofold.

First, we have reached our capacity. Our facility, at best, can only resolve the biomass bottleneck for approximately 15,000 acres of National Forest each year. This is one of the two reasons why 4FRI only treated around 17,000 acres in 2016. With a goal of 50,000 acres per year, we are woefully underperforming our objectives in 4FRI. The two solutions to this problem are to add contractor capacity, and to add biomass disposal infrastructure in the state. The small round wood utilization infrastructure will follow, if we can find a way to handle the biomass.

The second problem is the changing power markets. When we repurchased the facility in 2013 we immediately began an effort to extend the life of our current power purchase agreements and increase our capacity, but the changing renewable energy markets have decreased interest by the Utilities in biomass power because they can buy intermittent solar and wind for half the price. This market change in the macro level environment has lead me to campaign for biomass power with a simple slogan "not all electrons are created equal!"

Although every electron will do the same thing, the process of creating that electron varies significantly along with its benefit to the environment and to society. My opinion is that the megawatts we generate at Novo Power are the most valuable megawatts produced in the state. Here is some critical data to support that assertion:

- By funding forest and watershed restoration, biomass electricity addresses directly the two Arizona priorities of Fire and Water. Forest restoration mitigates the risk of catastrophic fires,

and prevents the further loss of watershed functions. It may even help a little bit with water augmentation.

- Biomass truly meets the definition of green energy, being produced locally and supporting directly the local economy and residents of the community where it is produced. Novo Power sources all of their raw feed stock from within 150 miles of our facility, which means all of the jobs are created and maintained in AZ. The number of indirect employees that work fulltime to support our little facility exceeds 100.
- Novo Power has a major impact on the rural economy of the White Mountain communities with ~40 direct employees. 2016 numbers show:
    - Novo Power Payroll with Benefits: $3.4M
    - Wood Supplier Payments: $7.9M
    - 3rd Party Services/Supplies: $3.97M
- The Bureau of Economic Statistics states that a 1.33 revenue multiplier applies to our direct economic impact to the economics of the local communities. Our overall economic impact therefore totals $27.8 million (M).
- Novo Power is also a 50% owner of Novo Star Wood Products, a local sawmill. We have an additional 20 employees and revenues in excess of $4.7M at NovoStar.
- Our feedstock is the no value/low value biomass that is making our forest unhealthy. Every ton we process improves the health of our National Forest:
    - Over 25% (~1 Million Acres) of the Ponderosa Pine National Forest in Arizona has burned in catastrophic wildfire in the last 15 years.
        - Prior to Novo Power going online, the cost to suppress these two fires along with private property damage exceeded costs of $250M.
        - In comparison, the San Juan fire of 2014 had similar potential but was limited to 7,000 acres and a cost of only $6.5M because it ran into acres where we had carried out restoration services.
    - We received a letter of endorsement from the Apache-Sitgreaves National Forest stating that we save over $1M annually in prescribed burning cost by removing and disposing of the biomass generated through restoration logging, as compared to leaving it in the forest.
    - The ~15,000 acres annually we assist in restoring are critical habitat for endangered animals such as the Goshawk and Mexican Spotted Owl.
- Our National Forest is the mechanism for capturing, storing, and releasing the rainfall in our state. In a state where the vast majority of its citizens live in a desert, the National Forest is perhaps the most important asset to the state. Beyond the real risk of burning more capacity to the ground, we protect the critical water infrastructure that exists in the state. Our reservoirs

are in real risking of “silting out” in the next generation along with the increasing cost to treat waters following forest fire.

- Our forest also generates some $3Billion dollars of revenue from hunting, fishing, hiking, tourism, etc. The work we do protects this industry by making the land friendlier to tourists and by removing potentially hazardous trees.
- Burning this wood in a controlled environment has the following benefits:
    - Methane is generated when biomass decays naturally in the woods. Methane is 25x more potent in capturing greenhouse gases in the atmosphere than CO2. When burned in a biomass facility, CO2 is released instead of Methane. Whereas fossil fuels release new carbon into the atmosphere from underground, the CO2 released by a biomass facility is already part of the atmosphere, having been absorbed over the past few decades by growing trees.
    - By burning in a controlled and filtered environment, particulate matter emissions are reduced by 90-98%.
    - SO2 emissions release acid into the environment and are a cause of acid rain. Our Biomass plant emits less than 10% of SO2 per megawatt in comparison to a coal powered facility.
    - NOx emissions generally create the "haze" seen in major cities and around industrial facilities. Our biomass plant emits less than 50% NOx per megawatt in comparison to a coal powered facility.
- We produce a renewable accredited power. We provide a baseload power at all times to the grid rather than the intermittent power generated by wind and solar. Biomass can be an excellent complementary power source to wind and solar and can take the place of natural gas or coal powered facilities.

The most important forest restoration next step in Arizona is to build additional infrastructure to process biomass. It is my opinion that one of the most economical and practical ways to process the biomass is to take it in raw form and make power from it. The more process steps we add to the biomass utilization, the more we make its disposal cost prohibitive. A simple example of this reality is based in the following data. One megawatt of power requires one bone dry ton of biomass to generate in our plant. We pay approximately $38 per bone dry ton for the biomass prepped to enter our boiler. If you were to pelletize this biomass to co-burn in a coal facility the cost on locally sourced pellets would be in the range of $120-$150 per bone dry ton. We generate a finished power product for significantly less than the raw cost of pellets alone. We have proven in the last 4 years that a biomass plant facilitates restoration and brings increased investment in higher value uses for the round wood. The Apache-Sitgreaves forest cannot keep enough wood in front of our industry and they provide $0 in subsidy for those acres. In fact, as stated above, they receive a $1 million benefit.

At this point, Arizona needs your help. Until we get our next major biomass facility built we will likely stagnate in a prolonged stalemate to solve this problem. Conversely, if a biomass solution is

implemented soon, the remaining objectives will be met in short order and we will see the largest restoration project in the country provide the impact we all hoped for. Here is how you can help:

- **Advance the pace and efficiency of Forest Service action.** This could involve moving to a more efficient and faster preparation process (Designation by Description (DxD) or Designation by Prescription (DxP)) and by adopting technology that allows for the limited funds to prep more acres (digital prescription technology). We cannot allow prep to "become the new NEPA" as the bottleneck to restoration implementation.
- **Insure that biomass electricity, generated from forest biomass removal, remains classified as a renewable energy.** The carbon foot print and emission impacts of a biomass facility are minimal – especially if you consider one of its key benefits: the reduction of risk for catastrophic forest fires, which release massive amounts of carbon into the air.
- **Provide fiscal incentives to make biomass power cost-competitive with other renewable energy sources.** Biomass power has long received half the benefits of other renewable energy sources through the Section 45 tax credit program, which expired for biomass on December 31, 2016. When facilities were eligible for benefits, it was harder for them to take advantage given the length of time it takes to build a facility. A new approach to tax incentives for biomass is needed.
- **Work with us to reduce the cost of transporting fuels to facilities, which is one of our biggest expenditures**. This can come in the form of matching payments or transportation credits like the Biomass Crop Assistance Program (BCAP), or in the form of a price per megawatt generated incentive. This ought to be tied directly to biomass harvested off National Forest so as not to incentivize the facilities that run on byproducts from other forest industry. This subsidy ought to come in the form of spending tied to preventive vs reactive restoration measures. If done right, this could help the U.S. Forest Service greatly reduce the amount it spends on fire suppression. For example, if we spend $1 Billion fighting fires in 2017, there should be a fund of $100 Million in 2018 for restoration services targeted at reducing catastrophic fire. The Biomass Power Association is lobbying for a similar fund for removing high hazard fuels from USFS lands with $117 Million in annual funding.
- The US government can provide power purchase agreements directly to the biomass facility to power government facilities like military bases, educational and administrative buildings. For example, Fort Drum in New York is powered by a biomass facility.
- Implement a pilot project in Arizona, as previously done in a few northwestern states that would allow a higher maximum truck weight on interstates for biomass related industry, in order to bring costs down through more cost effective transportation.
- Require that the Forest Service release by September 2017 a new RFP of 300,000 to 500,000 acres within the 4FRI area, in order to attract additional investments in round wood and biomass utilization in Arizona in order to meet the 50,000 acres annual objective of 4FRI.

The end goal is to restore the forest to a condition where we can reintroduce low intensity fire back into the ecosystem and let it play its indispensable role in preventing catastrophic wildfire. In the meantime, we use mechanized thinning as a first treatment that allows subsequent controlled burns. We remove the fuel load and restore the acres to pre-settlement reference condition and we do so while mitigating the risk of catastrophic fire, and at a fraction of the cost to fighting such fires. I often find it ironic that we focus on the cost of suppressing fire while not recognizing the enormous loss in natural resources in these mega-fires. We lose timber, water, animal life, recreational revenues, personal property, cultural identity and way of life, while emitting a horrific amount of particulate

matter and carbon into the atmosphere, and destroying the very mechanism that could recapture it. We have to fund the ecological services required to restore this national resource, and biomass removal and disposal has a big part to play in this restoration effort. If we deal with this issue correctly, industry will quickly do at landscape scale in Arizona what it has already done in the White Mountain: that is fund and implement industry-funded ecological restoration. What we have accomplished in East Arizona can be replicated in other areas of the state, the West, and across the entire country.