

Addressing an Immediate Commercial Solution for Biomass Pile Remediation and In-Forest Thinning

The Problem – Thousands of biomass piles exist across the National Forest landscape. Experts estimate that there is in excess of a million tons of dry, highly flammable biomass sitting on the forest floor. Each pile consists of tops/limbs stripped from trees logged for sale to regional sawmills or as part of a local forest thinning project.



Options to remove biomass piles are historically limited to controlled burning. Loyalton Cogen proposes to extract the biomass to produce renewable electricity.

A Triple Bottom Line Solution – A commercial system widely used in Europe is able to process 18,000 piles/year (roughly 100,000BDT) within an hour's distance of our plant. The system provides:

- **Lowest cost** of removal and transport to Loyalton Cogen
- **Beneficial Re-use** of the biomass chips to produce renewable electricity into the CAISO system
- **Significant Community Benefits** by reducing fire risk to homes, schools and businesses in and adjacent to the National Forests

Coupled to a Two-Part Solution:

1. **A Proven Collection System** – European forest land managers are required to thin and maintain millions of acres of commercially logged lands. We have the benefit of their experience to buy processing equipment that is efficient, low-impact and low emission.
2. **With an Operating 20MW Biomass Facility** - Loyalton Cogen is located at the intersection of the Lassen, the Tahoe and the Plumas National Forests. It offers a long-term customer for the biomass that is able to offset a significant portion of the extraction costs.

The Biomass Remediation Unit (BRU) Designed Specifically for In-Forest Biomass Removal and Forest Thinning- In partnership with a Swedish forestry firm and an innovative pulp mill owner in Washington State, Loyalton Cogen has assembled a practical solution which using existing equipment to convert biomass piles into fuel. The components consist of commercially available hardware that has been actively used for in-forest biomass residual recovery for many years.

Each Biomass Remediation unit includes:

- a Komatsu-Forest 855 eight-wheel drive forwarder equipped with a high-lift tipping bin, long-reach brush grapple, and

- one Bruks 806.2 STC chipper
- two short wheelbase trucks
- four 48' aluminum high sided trailers with sliding rear axles to permit tight turning capacity on logging trails
- two CLT 5'0x9' water course crossing bridges
- one road-side water-wash units to remove any mud from trucks and trailers as they enter state highways



Features of Each Biomass Remediation Unit

- All-weather tracked processor with low ground pressure
- Capacity to operate in most weather conditions
- No requirement for expensive transport of biomass to landings
- Two specialized trucks and four trailers able to operate on logging trails
- a wheel-wash system to remove mud/debris
- Two CLT portable bridges to cross water courses

Each unit includes two trucks and four all-terrain trailers specially designed for in-forest collection of biomass residuals which have already delivered more than 40,000 loads in Washington State for this purpose.

The forwarder is designed to operate in difficult terrain to pick up and grind existing biomass piles into chips. The chips are stored in an onboard bin and transported to the company's trailers located nearby on logging trails. The rubber-tired Komatsu Forest/Bruks forwarder unit operates equally well on public roads, logging trails, and in the forest. The forwarder also has special tracks that can be installed to reduce ground pressure in sensitive areas.

Delivering Significant Annual Benefits - Each Biomass Remediation Unit (BRU) will

- remove ~6,000 existing biomass piles
- deliver up to 33,000BDT of fuel to the 20MW Loyalton biomass plant and
- provide a long-term, lowest-cost solution to the USFS for pile removals

Delivered Biomass Quantities	One BRU		Three BRU's		Six BRU's	
	Minimum	Target	Minimum	Target	Minimum	Target
BDT/day	100	120	300	360	600	720
days/week	6	6	6	6	6	6
BDT/week	600	720	1,800	2160	3,600	4,320
weeks/year	50	50	50	50	50	50
BDT/year	30,000	36,000	90,000	108,000	180,000	216,000
Piles Removed/Yr - assumes 10BDT/pile	3,000	3,600	9,000	10,800	18,000	21,600

Delivery Schedule – Each processor can be shipped to Loyalton from Tennessee within four months after the order is placed. The trucks and trailers are immediately available from the owner that developed the system in Washington State.

Leveraging the Assets of a Local Biomass Plant – Loyalton Cogen will manage the operation of the BRU's plus utilize the chipped biomass to generate renewable electricity.

This innovative approach combines commercially proven automation with beneficial re-use of the chipped biomass to generate renewable electricity. The net result is a 45% savings to the USFS as shown in the table below.

Remediation Services Agreement	
Total Removal Cost/BDT	63.71
Less: Biomass Chip Purchase	28.00
Less: Payment for the raw biomass	0.50
Net Cost for Remediation/BDT	35.21

In Summary, Loyalton Cogen Offers:

- **\$4,500,000** of proven processing equipment to provide effective thinning operations
- **Up to 100,000 BDT of annual biomass removals** in the Tahoe NF on sites selected by the USFS
- **Guaranteed revenues from HHZ biomass feedstock** delivered to its plant.

The Komatsu-Forest 865 8WD Forwarder with an Integrated Bruks Drum Chipper, Brush Grapple & High-Lift Tipping Bin



The Komatsu-Forest 865 8WD Forwarder
with a Bruks Drum Chipper, Brush Grapple & High-Lift Tipping Bin
The Log Rack is replaced with the Tip-Bin shown below

