Project Title: “Improving the Efficiency of Planting, Tending and Harvesting Farm-Grown Trees for Energy”


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Congressional District: 4 (Corporate Office; Rogers, MN)
Congressional District: 7 (Farm Location; Glencoe, MN)
Congressional District: 6 (Equipment Building Location; Big Lake, MN)

MILESTONE 6 – SUMMARY REPORT (PUBLIC)
First Planting of Hybrid Poplar on 80 Acre Site

Executive Summary:

About 108,000 hybrid poplar tree slips were planted at 5 ft x 5 ft spacing on the 80 acre cropland site rented near Glencoe, MN by Energy Performance Systems (EPS). The planting was done on June 14, 15, 16 & 17, 2006 by an experienced hand planting crew supplied by Superior Forestry. Prior to the planting of the trees, the site was prepared by clearing existing bales of corn and soybeans from the site, spraying the field with glyphosate twice, and cross marking the untilled field to facilitate the establishment of straight rows. The unplanted area consisted of buffer rows and an area for small experimental trials. Accomplishment of a planting of > 60 acres in size, requiring 4 days to complete, will provide excellent information for comparing hand planting with machine planting, plus a lot of information on site variability effects. The size of planting also assures that future operational tending and harvesting activities can be performed thus allowing future project milestones to be met as planned.

Technical Progress:

As reported last quarter, 150,000 tree slips were purchased from Ostlie Nursery at a cost of $15,000. The slips are hybrid poplar NM6, 9 inches long and from 5/16 in. to 7/8 in. diameter. 150,000 slips were purchased to allow for the planting on 5 ft centers and to assure that extra slips would be available in case any quality issues were found. The slips were stored in a commercial freezer until May 23, 2006, when they were picked up and placed in a refrigerated truck (photo 1). During travel and storage prior to planting, the slips were held at temperatures between 34 and 38 °F. The refrigerated truck was moved to the project site on June 14 when planting began.
An important aspect of hybrid poplar planting is site-preparation prior to planting. When rented, the planting site had several soybean bales and corn stacks sitting on the site, plus a variable layer of corn and soybean crop residue on the site. Site preparation first involved removing, the soybean bales and corn stacks and broadcast spraying the post-emergent herbicide, Round-up (glyphosate), on May 8, 2006. The herbicide application was performed by a local herbicide applicator specialist using a large commercial rig with a 90 ft wide sprayer boom.

Once it was determined that the adjacent fields on the east, west, and south sides of our 80 acre site were being planted to corn, it was decided that it was prudent to create a buffer area on the east, west, and south sides, so that any chemical applications made to the planting site would not affect neighboring crops in the first year, and that adjacent crops also would not be affected by tree shading and root spread in future years. Also a buffer area was required on the N side to accommodate the turning radius of the tractor and planter and eventually the harvester. The full 80 acre site was managed by EPS for either buffer or experimental trials. On May 30, buffer areas on the edges of the 80 acre field were tilled and planted to oats. A portion of the field area was used for experimentation with a new pre-emergent herbicide and may be used next spring for other small experiments such as the evaluation of different hybrid poplar varieties if they become available. Under commercial conditions, it would be highly unusual to have a hybrid poplar planting area as small as 80 acres surrounded by cornfields (and thus be required to manage buffer areas). But prudency suggested we work with this situation in this Xcel funded, experimental trial in order to test the planting of poplars on soils normally planted to corn and soybeans.

A second application of glyphosate was required and performed on June 8, 2006. Organic farming production of corn and soybeans in previous years (where no chemicals were applied for weed control) had left the site with a heavy population of a wide variety of weeds. Weed control at time of planting (June 14-17) was relatively good (photo 3&4). It was unclear whether the second glyphosate application made on June 8 had yet taken full effect, since it can take up to 2 weeks for weeds to turn brown. An area missed by the herbicide spray (green strip in photo 5) demonstrated the effectiveness of the two sprays on the majority of the site.

The project proposal called for planting the hybrid poplar cuttings on an untilled site previously established to an annual crop. Because most experience with hybrid poplar planting has been on tilled land, it was decided that a few strips of tilled land should be included in the experimental design. After tilling 4 non-contiguous strips each about 100 foot wide, the entire field was marked at 2.5 foot intervals with a GPS guided John Deere tractor and a corn planter both lengthwise and crosswise providing a checked pattern marks in the soil for planting straight rows. This marking step would not be necessary with a GPS guided machine planter. The guide rows were much clearer in the untilled areas than in the tilled areas especially after a rain occurred.

To assure that an economically valid planting area was established by the milestone deadline and to allow for an adequate growth period in the first year, it was deemed necessary to hire a hand-planting crew. An experienced crew was hired that had also planted most of the other hybrid poplar plantings in the state of Minnesota in 2006 (photo 6). With only 1 crew available in Minnesota, our ability to schedule the crew at the time we needed it was difficult. Also
uncertainty regarding the precise day when they would be available made it difficult to time the
thawing of the cuttings and getting them moved to the site on the same day that the crew became
available. In actual fact, the crew became available a day or two before we were ready with the
thawed cuttings and we had to pay a “retainer” fee to keep them available for our planting. This
type of problem would not be as likely to occur with the availability of a fully automated
machine planter. The necessity of hiring a hand planting crew provided the project a valuable
opportunity to obtain a comparison of hand planting and machine planting issues. Of particular
interest will be comparisons of planting rates and estimated costs. Casual video was taken of the
hand planters primarily on the first day of planting. While the video does not provide the
information for a statistical analysis of effects of individuals and soils on planting rate, it appears
that planting generally took 7 to 15 seconds between each cutting insertion, with a mean of 9 to
10 seconds on the first day. A small video segment of the planting on the last day suggested that
the rate of planting had been reduced to about 6 seconds per cutting. A calculation of the
number of men x estimated planting hours/ divided by estimated number of cuttings planted
suggests an overall rate of about 7 seconds per planting over the 3.5 days. A video of machine
planting will be taken next year to give a visual comparison with the video of hand planting.
One element that will be of interest will be the variability in amount of cutting exposure above
ground. Depth of insertion of the cuttings was quite variable with the hand planting crew but is
anticipated to be considerably less variable with the machine planter.

The area planted by June 17 was about 78% of the site or ~62 acres with the rest of the site being
planted to oats for a buffer or managed for additional experiments. The planting size is large
enough for use of commercial tending equipment and more than adequate for testing the
harvester when the trees reach harvest age.

Following planting, pre-emergent herbicide sprays were applied to the site on June 20, 2006.
Spraying could not be started until the hand planting was completed due to regulations
established to prevent any adverse health concerns from herbicide sprays on field workers. The
spraying was further delayed a few days after planting due to a 2 inch rain event on Friday night
(June 16) which resulted in several areas of the field becoming very wet. A few of the cuttings
which had started to break bud (some planted on June 14) were possibly damaged by the late
spraying. Research experts from the herbicide companies were consulted and they predicted that
damage was likely to be minimal but nevertheless could have been one contributor to the growth
variation observed in the field.

One very large benefit of the June 16 rain was that ¾ of the cuttings planted were “rained in”.
That means that soil gaps around the cuttings were closed (photo 7), and in many cases, the
cuttings were actually entirely buried by the soil. This helped to avoid adverse effects due to
variability in exposure of cuttings above ground. Both cutting exposure and delay between the
first day of planting and the ability to do the herbicide spraying would be expected to be
minimized with a fully mechanized machine planting approach.

The herbicide applications included a comparison of two types of pre-emergent mixtures which
have been used successfully by other hybrid poplar planters in Minnesota on lighter soil types.
A tank mixture of the herbicides Scepter and Prowl was applied to the 62 acres planted with
hybrid poplar cuttings. These herbicides target broad leaf weeds and grasses respectively and
appear to work best in combination. A different herbicide, Sureguard, was applied on the same
day to the acres designated for additional experimental work (separate from the “commercial
scale” planting). SureGuard, is a relatively new herbicide with both pre-emergent and post-
emergence activity.

Planning for monitoring, tending and data collection was done shortly after completion of the
planting. A local farmer agreed to (and did) walk the site on a frequent basis to monitor for weed
growth and insect or pest infestation. A University of Minnesota hybrid poplar research team
agreed to (and did) assist with data collection on tree growth in the fall. By July 1, 2006 when
the initial writing of this report began, it had been anticipated that most of the needed tending for
the growing season (site preparation and applications of herbicides) had been completed. That
did not turn out to be the case, as additional weed control efforts were needed. Tending and
growth information will be addressed in a future milestone report.

The accomplishment of deliverable 6 requires observation by a RDF representative of the
planting area as well as submittal of a written report that is satisfactory to the RDF
representative. Mark Ritter, the contract manager for Xcel on this project, visited the planting
site on Friday June 16, 2006, thus, with submission of this report the deliverable requirement for
milestone 6 has been met.

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Photo 1 – Cuttings stored in plastic bags, heavy cardboard box and plastic wrap being held inside of a refrigerated truck at average temperatures of 35°F, cycling from 34 to 37°F. Photo by Lynn Wright on June 14, 2006.

Photo 2 – Buffer strip of oats on east side with view toward north; corn on neighbor farm. Photo by Lynn Wright on June 16, 2006.
Photo 3 – view of mostly dead weed cover on un-tilled and tilled areas. Photo by Lynn Wright on June 14, 2006.

Photo 4 – Close-up of mostly dead weed cover on un-tilled area. Photo by Lynn Wright on June 14, 2006.
Photo 5 – Weed cover in green strip missed by glyphosate herbicide. Wet areas resulted from rain on June 16, 2006, photo taken by Lynn Wright on June 18, 2006.

Photo 6 – Experienced hybrid poplar planting crew. Photo by Lynn Wright on June 14, 2006.
Photo 7 – Close-up of cutting in ground on June 17 after June 16 rain resulted in closure of soil around cutting. Photo also shows status of buds of cuttings planted June 16, 2006.