Text Version for Biomass Program Manager Paul Bryan's Tour of the Feedstock Logistics Section of the Biomass 2011 Interactive Exhibit Hall (Part II)

[The video shows Biomass Program Manager Paul Bryan interviewing Kevin Kenney of Idaho National Laboratory.]

Kevin Kenney: So one of the objectives of the feedstock platform is to supply high-quality, low-cost feedstock.

Paul Bryan: Absolutely.

Kevin Kenney: That's been an objective for a long time, to make [inaudible] and we continue to focus on that, developing harvest selection storage system that will do three things. They reduce costs, maximize quality, and they also enable sustainable practices.

Paul Bryan: And when you say maximize quality, are you using that in the better, or the more consistent definition, or both?

Kevin Kenney: Probably the more consistent.

Paul Bryan: That is critical.

Kevin Kenney: Right, probably the more consistent.

Paul Bryan: Especially for biological conversion.

Kevin Kenney: Exactly, the idea is, we work a lot with the manufacturers, with AGCO, and many of the projects DOE is funding - and first of all identifying efficient low cost methods, the next is identifying ways that we can produce high quality material that can then be delivered to a depot for final processing.

Paul Bryan: Right.

Kevin Kenney: We look at... our goal is to develop recommended practices, we know that we got to be flexible enough that farmers can make decisions that are best for them. So whereas, we might say, we know that, for example, that the AGCO large square is ideal for efficiency, for reducing cost, for producing a high quality product. But, we know that it doesn't work for everyone.

[The video shows a large square bail of wheat straw.]

Paul Bryan: Sure.

Kevin Kenney: We look at our job is to develop those recommended practices. We know from experience, we have the data to show it, that this is the preferable way.

Paul Bryan: Right.

Kevin Kenney: And it may be based on those recommended practices. But the supply chain has to be flexible enough to accommodate other things.

Paul Bryan: Absolutely.

Kevin Kenney: Such as this bale behind you.

[Kevin shows Paul a round bail of pinyon juniper.]

This bale is really, compared to some of the other bales behind you is quite [inaudible]. This is basically a single pass method for collecting pinyon juniper – one of the largest resources in the west.

Paul Bryan: It is; they really want to get rid of it in a lot of places.

Kevin Kenney: Exactly. One of the places that will work would be [inaudible]. The whole concept is we have these recommended processes, they say you package it in this way, you collect it in this way, to minimize ash content for example. And we know that if the farmer doesn't follow those practices, and they deliver a bail that is full of dirt and high in ash content, we have the technologies to clean it up. We have the technologies for repackaging this material, so we can size reduce it, we can densify it, we can clean it up, we can repackage it into a high quality, efficient handling, feedstock. So it's important to distinguish between – this is biomass, in our depot, we convert biomass to feedstocks.

Paul Bryan: Great. What do we got over here?

[Kevin and Paul walk through the feedstock station.]

Kevin Kenney: This is our approach to convert raw biomass to high quality on-spec feedstocks through preprocessing, which encompasses three things: pre-conversion, formulation, and densification.

[Paul speaks with Richard Hess of Idaho National Laboratory.]

Richard Hess: We have to take the raw biomass, which is not on-spec, and get it into a spec, or a density that the conversion folks can use it. So that is the main elements of the feedstock platform.

Like Kevin said, we break it up into pre-conversion. Pre-conversion, and I mean, the best way I can explain that is to, to prepare the ingredients, like you're going to bake a cake, you separate the egg whites from the egg yolks, and so pre-conversion, includes chemical processing, like

AFEX (ammonia fiber expansion) and hydrothermal carbonization or… thermal processing, like torrefaction, or other things. Then you have formulation, you have to blend the materials together. And it can be as simple as blending, or it can be as complex as starting to consider the chemistry, or the catalytic functions of different materials... [inaudible].

Paul Bryan: Yeah, just a little bit, I was able to sit in on about half of the advisory group meeting.

Richard Hess: Yeah, so they got one down there. They are blending eucalyptus, switch grass, corn stover, and pine; and they blend those four together; and they're finding an almost tenfold increase in the yield of sugars and other products off the back-end.

Paul Bryan: Really?

Richard Hess: They have some theories as to why that is, but they believe it is helping to adjust the pH, and different products are catalyzing each other. And there are companies over in Europe, like Verdo, that has a fundamental strategy of feedstock formulation. In fact, the front end of their plant looks like a livestock feed formulation facility, it has got all the piles siting out there, and they give the loader operator a recipe and he takes so many scoops out of each pile. And they control their slagging, they can control everything inside their facility.

Paul Bryan: It would make sense that some formulations would have synergy. Probably some of them have negative synergy. It's worse than anything alone. But if you do some experimentation, maybe over time, some more scientific principles emerge, and it's not all Edisonian.

Richard Hess: Yes, correct. Then finally, the densification, and of course, at Idaho National Lab, we focus on the solid densification work, and you know, PNNL and others, focus on the lignin systems. But densification not only gets us that material, now in a dense stable form, it can be used, but it can also kind of be like baking the cake, can set the recipe for us. So those are the functional parts of the programs. Dealing with the raw biomass...

[Richard Hess shows Paul a model of INL's Deployable Process Demonstration Unit (PDU).]

So this is our tool set. See here is our mechanical grinding system. This is the rotary kiln, some of the thermal systems we got available to us, another mill that can do different types of mechanical type processing and separation. We got a mixing bin over here, and then here is our densification unit right there. What is neat about it, is the pieces can be moved around, so if we want to skip this piece and go through here, or take that piece out, and put a torrefier in here.

Paul Bryan: Yeah, so if some third party even comes in with their own technology, and they wouldn't have to build all this other stuff around it, they could just plug in, or even take a slip screen maybe. And this takes 16 semi-trucks to redeploy the whole thing.

Richard Hess: If you take the whole thing, yes. What you find, most of the time, is just like you say, they just want pieces or parts. But I think the exciting thing about this, is this tool, and JBEI

and NREL, and PNNL, the Office of the Biomass Program have a network of PDUs that can be used for virtually anything that you can dream up now.

Paul Bryan: We do. We have the cellulosic ethanol small scale pilot at NREL, the advanced biofuels PDU at LBNL, and now this, the deployable PDU for feedstock processing at INL. It's a great presentation.

[Paul Bryan speaks with Chris Wright of Idaho National Laboratory.]

Chris Wright: Yes, thank you. So this section here starts to get into the actual products made by us. Densification, as you know, is a primary interest for the whole industry, as you mentioned in your previous discussion. And so, INL is looking at several densification technologies for solid biomass, as well as the precursors for that that can go into the liquid form, and so the basic technologies that exist today are illustrated here. Some of the precursor feedstocks that are required to start that process; this is corn stover ground to a quarter minus.

[Chris shows Paul samples of biomass at different stages of processing.]

Paul Bryan: Ok, so over there, we saw the bales, and now this has been partly preprocessed.

Chris Wright: This has been partly preprocessed, that is correct, no treatment other than size reduction at this point. There are two sizes here. The quarter minus is sort of the target size for the biochem process. It could be larger, but this is kind of a nice size to target, for us.

This is about a two millimeter, or about an eight inch size, smaller than an eighth. This starts to make a nice feedstock for pyrolysis, for efficient heat transfer, and of course as you get smaller, you have more processing, so we look at more effective processing methods, that can reduce that cost.

[Paul Bryan reaches into the bucket and lets particles of biomass sift through his fingers.]

As we move to hear, this is an example of a densified product. This is corn stover, it make really nice pellets. The grasses and the ag residues are fairly new for the industry to get into. Alfalfa is pretty common, but corn stover, wheat straw, switchgrass, pelletizing those, they have different characteristics, and they require different methods to get them to this stage. But this is an example of a uniform feedstock, it will move in the grain system, so it fits that criteria. The cost may not be there, so we have to continue to look at better and more effective ways to do that.

[Chris Wright and Paul Bryan pick up pelletized pieces of biomass and pick them apart.]

Paul Bryan: Is the storage stability of this material good?

Chris Wright: This is not bad. But still because of the perishable nature, the grasses can have off-gassing issues and different things like that. So some ideas to preserve the materials, so it doesn't off-gas during storage, is a concept we are looking at. So it has some stability issues, but it is by

far, more superior to the raw material, about 8% moisture, and because of its dense package, it will fight off any degradation.

Paul Bryan: Ok, Chris, thanks very much. I have to be heading up stairs, but I appreciate it.

Chris Wright: Ok, not a problem. Thanks, Paul.