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ROLL NUMBER

DESCRIPTION

1458

2007 HOUSE NATURAL RESOURCES

HB 1458

2007 HOUSE STANDING COMMITTEE MINUTES

Bill/Resolution No. HB 1458

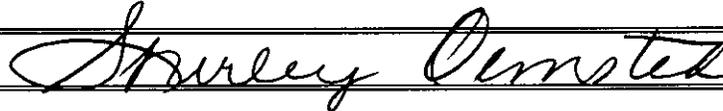
House Natural Resources Committee

Check here for Conference Committee

Hearing Date: January 26, 2007

Recorder Job Number: 2005

Committee Clerk Signature



Minutes:

Chairman Porter opened the hearing on HB 1458 and the clerk read the title.

Representative Monson, from District #10, came forward as the sponsor of HB 1458. The first section of the bill simply states that we should have a goal of increasing our use of hydrogen from any and all of our states energy resources, renewables and lignites. I don't know how much you know about hydrogen, but hydrogen is the perfect fuel. When you burn hydrogen, you get nothing but water vapor. If you are following some waste technology with hydrogen, hydrogen through fuel cells can create energy as well. There have been a lot of advances on fuel cells as of late so hydrogen can be either burned in a combustible engine or it can be used for fuel cells and utilized that way. A little basic chemistry on the production of hydrogen; we can take hydrogen out of water by simply running electricity through it. There a methods of getting hydrogen from methane and other fossil fuels. Lignite can be gasified and a real simple explanation would be to take your carbon which is the main ingredient and run some hot water or steam through it and that is a method of turning it into methane and other gases and then can be used as a source of your hydrogen. I don't think anyone that looks at fuels can say that hydrogen is not the perfect fuel and to have a goal of using more hydrogen in our system throughout the whole energy economy could disagree that this would be a very

good goal. Section 2 directs the Commissioner of Commerce to oversee the development and implementation of a roadmap or a plan to achieve the goal that is laid out in number 1 which is to simply increase the use and production of hydrogen in the state. If you read through that section on page 1, lines 17 & 18, it talks about a roadmap should establish a vision, goals, general timelines and measurable milestones for achieving the state's hydrogen goal. It is pretty broad and general and gives the Commission a lot of latitude but directs them to say that we need to develop this goal and how are we going to get there and when. On page 2 of the bill, still in section 1, lines 2 through 5, it says the department shall involve the energy industry, manufacturers, technology companies, farm organizations and commodity groups, universities, nonprofit organizations, and other interested parties in developing the roadmap. I am sure there are a lot of people who would be more than happy to step forward and give the Commissioner of Commerce ideas on what they feel would be important parts of this roadmap. Also in this section on the next few lines it does talk about if the department wants someone else to do it they could subcontract to develop the roadmap. In the end, the department would be responsible to get this report that is developed back to the Legislative Council by July 1, 2008. In section 3 there is an appropriation. This appropriation is from one time money from the general fund. It ends June 30, 2009, and if it doesn't develop, the money would not be spent. It is asking for two hundred thousand dollars to be given to the North Dakota State University as a pass through grant to any partnership that might come forward or any industry that is interested in the fueling or any kind of hydrogen station if you will probably in the city of Fargo. The reason Fargo is mentioned here is because they have a partnership with Moorhead as the state of Minnesota has put up some money for this as well. NDSU is going to be the overseer of this money as a state agency that we can hopefully depend on them to make the decisions. This is our contribution from North Dakota to step up to the plate and

leverage other funds from other sources being that Federal, other states or local partnerships with industry to try to get some model hydrogen station going.

Representative Keiser asked with new language in these processes. Can you tell me the difference between a roadmap and a feasibility study?

Representative Monson said they are pretty much the same thing. Maybe a feasibility study is better. In this case, the word roadmap was used because we already know it is feasible.

Representative Keiser said the two hundred thousand dollar commitment he supports but suggested that this is really a partnership with industry and the city of Fargo. Would you support an amendment saying up to two hundred thousand dollars with matching funds to be matched on a dollar to dollar basis by industry so that we really have four hundred thousand dollars to work with a partner that is committed?

Representative Monson said the only problem with that is that perhaps industry is going to stick in way more than two hundred thousand. Minnesota is putting in more money than this also. These two hundred thousand dollars may not go directly to the industry or the partnership but it may be needed for matching funds for federal funds or something like that. I don't know if I want to tie the hands or specify that it has to be matched. I expect that there will be more than two hundred thousand dollars from industry put into this.

Representative DeKrey asked why they were using NDSU. Why specify it to anyone? UND has the energy brochure.

Representative Monson said the main reason for Fargo was there was a bill in last session that was a similar version of this. It was expanded and included some things with EERC and the city of Minot who was interested in this. Fargo is the one that is already to go with this and has already developed these partnerships. I hesitate to even name the city of Fargo in here but NDSU is kind of the pass through and they are located in Fargo and Fargo is the one

spreading the role on this. Moorhead is on board with this too. I guess that is why we picked NDSU. It just makes it a little cleaner. Actually EERC does a lot of work on this.

Representative Nottestad asked if there was anyone from EERC here today. He wanted to read the last part of their testimony. The requested legislation is an unnecessary duplication of an existing program, and, even if funded at the level requested, would be a very pale imitation of an existing robust program. See EERC testimony marked as Item #1. I would hope you would read this and respond to that.

Representative Monson said he had read that and I guess I don't necessarily agree with that as being a duplication because you tell me where there is a fueling station in North Dakota. There is none and they have done a lot of research with hydrogen. This is to get industry to come and actually put a site here that is going to be commercial industry driven. I can't deny that the EERC is certainly a leader on hydrogen experimentation but this is more than experimental research. This goes beyond that. This will get a working commercial site in North Dakota.

Mr. Scott Kelsh from District #11 also came forward in support of this bill. He thinks this a very exciting opportunity and it also has a lot of military applications. The city of Fargo has been looking at purchasing a hydrogen bus at some point and this would be a great opportunity to help this project as well.

Mr. Brad Crabtree of the Great Plains Institute came forward in support of HB 1458. Please written testimony marked as Item #2. He also passed out testimony from Cass County Electric. Please written testimony marked as Item #3 and testimony from the Fargo-Moorhead Chamber who also support this bill. See written testimony from the FM Chamber marked as Item #4. He feels that this bill is a great way to advance our energy policy. This is not duplication and we are being left out of the hydrogen production game in terms of delivering

hydrogen to retail customers who use hydrogen. We are not being left out of hydrogen research or hydrogen technology development, but we are being left out of in terms of the roll out of this. It is being done on the coast and that is where the people are. Our region deserves a fair share of that and so does our state. There is a hydrogen fact sheet attached to my testimony. The Minnesota legislature is asking for ten million dollars to invest in hydrogen. The legislature committed to six hundred thousand for fueling stations last session but we worded the bill wrong and the Department of Commerce couldn't use the money. We are going to fix that portion of the wording. Moorhead is not opposed to having the fueling station in Fargo. That concludes my testimony.

Representative Keiser asked why not require the partnership with industry.

Mr. Crabtree said he has three observations. If there is a way to change the wording so that it doesn't create restrictions that we will later regret, I don't have a problem with that. As a practical matter depending on how we produce the hydrogen but all of them will require more than two hundred thousand and more money than the State of North Dakota and Minnesota together would be putting into the project. If you feel that it is important to have wording that makes that clear so that the money doesn't get spent without that, I would hope that the committee would check with Representative Monson on the wording issues in that respect. The one thing that I would ask that is very important is that in whatever changes you might make to the appropriation language that it not be changed to a fueling station but remain specifically a hydrogen production system because that is one of the problems that we had in Minnesota is we used fueling station and it may be that the first viable approach is not a true gas station type concept that we all have from our own experience in liquid fuels, but simply a dispenser of hydrogen that fleet vehicles can use. That why that language is very intentional so that we keep our options open.

Representative Keiser said in the fiscal note it has the requirement that this must be completed by the end of the coming biennium. Is that going to work?

Mr. Crabtree said if there is a way that doesn't cause problems it would be good if we could extend this beyond the biennium. I think that would be helpful because there is a lot of work involved. We just put together a consortium of twenty one institutions and bid on a federal hydrogen fuel project and it was an enormous amount of work and it took a lot of time. We have the commitments and partnerships to work together but all the designs and all the contracting takes time and if we could have a little bit more flexibility that would be ideal. He also does not want to put the appropriation at risk.

Vice Chairman Damschen asked for further testimony in favor of HB 1458

Mr. John Valenter said they were fighting OPEC trying to do this stuff. This is all about the election anyway. He thinks the taxpayers are spending a lot of money on this. I know you have to go ahead and do this stuff because that is political but unless OPEC lets this thing happen you can stick all the money you want into this and it really isn't going to go anywhere.

Representative Solberg said he was a bit confused. He asked if you were supporting this legislation or opposing this legislation.

Mr. Valenter said it sounds like he is opposing it but he is actually supporting this bill. You have to do something even if it is wrong.

Mr. Kim Christenson from the Department of Commerce came forward as being neutral on HB 1458. It was not included in the governor's budget. They did want to indicate to the committee that they have the willingness and capability to undertake the task that is outlined in Section 2 in the development of the roadmap. There concern is that this looks like a significant task and that we can subcontract this out, but there is no money in the appropriation section that provides resources for this and that is obviously a concern. We do see a bright future for

hydrogen development in North Dakota. We are involved in a couple of projects with Basin and the EERC so again we are certainly willing to carry out this particular action.

Representative Keiser asked how much money does the department want to produce this roadmap?

Mr. Christianson said again it is always difficult what something like this will cost but in the initial discussions there was a talk of about fifty thousand dollars appropriation on this.

Vice Chairman Damschen asked for any opposition on HB 1458.

Mr. Curtis Jabs from Basin Electric came forward with testimony and taking a neutral stand on this bill. See written testimony marked as Item #5.

Representative Keiser said it didn't sound neutral to him because of the location in Minot and the language in this bill places it with NDSU and Fargo. It would make it unavailable for consideration by your organization.

Mr. Jabs said that this project is moving forward and he would let the sponsors of this bill address that. The reason we are neutral is because we are counting on the wisdom of this committee and the Legislative Assembly decide how to move forward with appropriations and where other projects should be located.

Mr. Ron Ness of the ND Petroleum Council came forward in opposition of this bill. Their member companies are investing millions in hydrogen research. There are a couple of things on this bill that he wanted to point out. This appears to be more like a resolution for a study and a comprehensive energy policy for the state rather than putting some of this language that will possibly be quickly outdated with technology into code. Secondly, some of the information that I have been reviewing appears that natural gas seems to be the most prevalent usage for hydrogen cells in the future. That is not contained in Section 1. Some of our companies are engaged with EERC at UND. They have become the state hydrogen center with a very large

sum of money from Senator Dorgan and it seems to me like there should be a way to collectively do this through that organization or other places as opposed to putting specific statutes in the law like this. We do feel that the hydrogen economy is likely to come someday down the road and many of our companies want to be the ones that are also supplying that energy to the consumers.

Representative Nottestad wanted to make reference to the last page, line 7. The department shall report to the Legislative Council regarding the final roadmap. He quoted the comments from Mr. Groenewold and the testimony from EERC. "I find it interesting that the bill recommends one of the deliverables be a "final roadmap by July 1, 2008". Any "roadmap" delivered on a specific date will certainly be outdated within a few months, because of the constant stream of major technological breakthroughs associated with hydrogen and fuel cell technology, many of them coming from the EERC. Do you see a final roadmap as what we are going to do with hydrogen?"

Mr. Ness said he agrees with the comments from Mr. Groenewold of EERC. To predict that anyone can put in this code what are future energy sources will or will not be and try to lay out that roadmap appears to be going down the wrong path as we apply ourselves to certain technologies. The technologies are every changing and we need to remain flexible and the state needs to remain flexible.

There was no further testimony for or against HB 1458. The hearing was closed.

2007 HOUSE STANDING COMMITTEE MINUTES

Bill/Resolution No. HB 1458

House Natural Resources Committee

Check here for Conference Committee

Hearing Date: February 1, 2007

Recorder Job Number: 2591

Committee Clerk Signature

Surely Elmsted

Minutes:

Chairman Porter asked the committee to consider HB 1458. This is the hydrogen goal with the \$200,000 appropriation. Basin Electric was neutral and the opposition was Ron Ness of the North Dakota Petroleum Council.

Representative DeKrey made a motion for a do pass with referral to appropriations.

Representative Kelsh seconded the motion.

Chairman Porter asked for discussion. Seeing none, he asked the clerk to call the roll. Let the record show that there were 11 yes, 2 no, with 1 absent for a **do pass with a referral to appropriations**. **Representative Kelsh** will carry the bill to the floor.

Date: 2-1-07
 Roll Call Vote #: _____

2007 HOUSE STANDING COMMITTEE ROLL CALL VOTES
BILL/RESOLUTION NO. 1458

House Natural Resources Committee

Check here for Conference Committee

Legislative Council Amendment Number _____

Action Taken To Pass w/ referral I approve

Motion Made By DeKrey Seconded By Kelsh

Representatives	Yes	No	Representatives	Yes	No
Chairman – Rep. Porter	✓		Rep. Hanson	✓	
Vice-Chairman – Rep Damschen	✓		Rep. Hunskor	✓	
Rep. Charging	✓		Rep. Kelsh	✓	
Rep. Clark	✓		Rep. Meyer	✓	
Rep. DeKrey	✓		Rep. Solberg	✓	
Rep. Drovdal		✓			
Rep. Hofstad	✓				
Rep. Keiser					
Rep. Nottestad		✓			

Total Yes 11 No 2

Absent 1 Keiser

Floor Assignment Kelsh

If the vote is on an amendment, briefly indicate intent:

REPORT OF STANDING COMMITTEE

HB 1458: Natural Resources Committee (Rep. Porter, Chairman) recommends DO PASS and BE REREFERRED to the Appropriations Committee (11 YEAS, 2 NAYS, 1 ABSENT AND NOT VOTING). HB 1458 was rereferred to the Appropriations Committee.

2007 HOUSE APPROPRIATIONS

HB 1458

2007 HOUSE STANDING COMMITTEE MINUTES

Bill/Resolution No. HB 1458

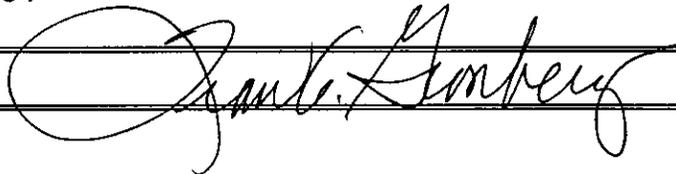
House Appropriations Committee

Check here for Conference Committee

Hearing Date: 2-6-07

Recorder Job Number: 2954

Committee Clerk Signature



Minutes:

Chairman Svedjan opened the hearing on HB 1458 which was rereferred from Natural Resources

Rep Todd Porter, Dist 34: The basic premise of the bill is to provide in Section 1 a hydrogen goal, Section 2 is a demonstration project through the department of commerce that basically is establishing through the goal and the system the hydrogen road map for the state of ND. The demonstration project is a \$200,000 appropriation on page 2 that would be going through the Dept of Commerce in partnership with industry and the city of Fargo for a commercially promising hydrogen system. For the most part this would be a vehicle refueling type station within the city of Fargo to take the next step in our commitment to hydrogen energy and reducing our dependence on foreign oil supply.

Rep Pollert: Aren't we doing this work at the EERC in Grand Forks?

Rep Porter: The EERC did present some information to us during the committee hearing. They are doing hydrogen research for basic projects. This program is an implementation saying the research is done and we are ready to implement a fueling station for vehicles inside of Fargo.

Chairman Svedjan: What more can you tell us about the partnership? The \$200,000 helps support the partnership, what does Fargo have to do?

Rep Monson: The city of Fargo is partnering with Moorhead. And Moorhead being in Minnesota has access to a lot more funds than the \$200,000. This \$200,000 is helping to bring ND to the table to access some of the Minnesota money that they're pulling up through Moorhead. I'm not sure what Fargo as a city is putting up but there are many other dollars from private industry that are getting this station up and running. So this is not research, this is ND's attempt to leverage money from federal, from city, from Minnesota, and every other source. And Moorhead, even though it is in Minnesota, is willing to have this station located in Fargo.

Chairman Svedjan: So really all this bill does is establish a goal, although a non specific goal. And then it provides the funds to leverage other funds to establish a refueling station in Fargo. Is hydrogen at the point right now where the availability is not the question and also the demand there for its use?

Rep Porter: One of the companies that testified neutrally on the bill was Basin Electric and they right now have a project going in Minot and they are going to run the electrolyzer with wind energy and convert water into hydrogen. They are working with flex fuel vehicles that will run on hydrogen. There is nothing on flex fuel vehicles for public use at this time.

Rep Svedjan: Did that project start without any state support?

Rep Porter: I don't know. I would guess that others participated. It says that it's a partnership with the US Dept of Energy, NDSU, North Central Research Extension Center, and others.

The appropriation is contingent upon the securing of the other funds from the other partners. So it is a public private partnership and one can't happen without the other.

Rep Glassheim: Is the appropriation for a different purpose than sections 1 and 2. Those seem to be planning goals and the appropriation seems to be for production.

Rep Porter: That is right. Section 3 is the implementation.

Rep Wald: Is the phraseology roadmap out of the US Dept of Energy?

Rep Porter: We didn't get to the discussion of terminology.

Rep Monson: It's the terminology used by the Dept of Energy. We didn't invent it.

Chairman Svedjan: On page 2, line 2, it refers to the "department". Since this appropriation is going to NDSU, is that who the dept is?

Rep Porter: I believe that 546003 is in the Dept of Commerce.

Chairman Svedjan: The costs for development the roadmap, and the vision, that the Dept of Commerce would have the resources available to do that within their existing budget?

Rep Porter: The Dept would be the gatekeeper to the implementation or definition of the roadmap as they move forward. On line 3, it shall involve, the dept would be tasked to bring the groups together and then come up with the plan.

Chairman Svedjan: It indicates that they may subcontract without a cost sharing component. It appears that they would need to fund it out of their existing appropriation.

Rep Nelson: This issue was an issue that the legislators forum requested a working group to work on. Much of this roadmap is in place. This is an infrastructure need for that fuel station. In the upper Midwest there is a network that is being developed in ND, SD and Minnesota and Manitoba, Winnipeg, Fargo, Sioux Falls, Minneapolis, Duluth, - they are all online to become refueling stations. So it's important that if we are going to be in this loop, we need to have a refueling station somewhere in the state. There are some hydrogen use vehicles in Winnipeg in use in their transit fleet. The technology is very close if not here. It puts us in a very

competitive relationship nationwide as moving forward in commercial hydrogen infrastructure building. It's a very good first step for this state.

Rep Monson: There's a map (basically an H) I-29 is the left leg of the map, Mpls to the east, and connecting Fargo to Mpls that is the next spot where the refueling station would be. So Fargo is very key to this because it's not only on I 29 but it's also on I 94 heading to Mpls. Anyone who wants to use hydrogen must have some place to refuel along this route. The availability of vehicles to use hydrogen fuel - most of the vehicles that are using it are internal combustion engines using hydrogen. Hydrogen doesn't get good mileage, it had very low BTU's. But it's absolutely the perfect fuel. Hydrogen when it burns turns into water vapor, and that's it - no carbon dioxide, no carbon monoxide. It can be made from lignite, methane and those are the most efficient places to get it - it can be made from wind using electrolysis of water. So there is no real shortage of hydrogen. And it can use all of our sources of fuel to make it.

Rep Aarsvold: The EERC has a significant grant that they are working on for hydrogen fuel at the moment. Is there a relationship between what we're seeing in this bill and the EERC grant?

Rep Monson: No there is not. EERC is doing research. Their research is somewhat secretive because industry does hire them to do research. Whoever pays the bill gets the data and it really isn't a public source of information. President Bush even several years ago said that one of the main pushes that he wants to see happen is that we have fuel cell development. And there are numerous companies out there working on it.

Rep Guleson: Section 2 that does speak to building the roadmap - because the EERC got the very sizable center of excellence grant, one of the largest we have given out, now wouldn't that information be public information since it's been funded previously?

Rep Skarphol: Some of that information would be proprietary and they would not be required to share it - especially with industry being involved.

Rep Wald: Who owns the stations - who sells the fuel?

Rep Porter: It's like a gas station. The funds from the state are more or less seed money to help get the further matching money from the public private sector partnership. As far as ownership of the area it could be anybody - someone in the industry or Cass County Rural Electric could end up being the owner. The City of Fargo could potentially end up being the owner.

Rep Wald: Could it be a Conoco or an Exxon?

Rep Porter: Absolutely. It could be anyone who is interested in working toward this goal.

Chairman Svedjan: My concern is whether or not we are ahead of ourselves. Where does it fit within the priority of alternative fuels? We have a lot going on in this state with regard to ethanol, bio mass, etc. Does this tie up \$200,000 that could be used elsewhere or not used at all?

Rep Porter: In order to start seeing the movement or the globalization the technology in the vehicles there needs to be a secure network of refueling stations. Because of the low BTU's and the need for refueling, if the choice is to drive the vehicle from Winnipeg to Sioux Falls, and not having a center point to refuel, then the individual is not going to be able to utilize that vehicle. We need to be on the map as a stopping point.

Chairman Svedjan: You still won't be able to drive anywhere west. What's going to happen here? I presume that's what the roadmap will help decide too. Is the state going to be looked to to put up a couple hundred thousand dollars for every station that's developed in the state?

Rep Porter: I would expect that the private sector would get involved.

Rep Svedjan: That's another issue for me. You're seeing Basin Electric getting involved in Minot without any state support. Couldn't this also happen in Fargo?

Rep Porter: The Basin Electric project is an EERC project. So there is centers of excellence money and federal dept of energy money and other money that is being used for that three vehicle pilot project up there. It's not strictly private.

Rep Monson: You bring up a good question, in the future and two years from now are we going to have another group asking for money. This project is a one time shot at leveraging the money that Minnesota and other partners are putting on the table.

Rep Wald: If they're going to be making hydrogen out of coal, would it be appropriate to take the \$200,000 out of the lignite research fund rather than the general fund? Isn't that the purpose of the research fund?

Rep Nelson: The Minot project - the wind farm or those two wind generators were in production and Sen Dorgan secured some DOE money for the hydrogen project. And that's where that money was funneled through to fund this project. So I think that it's appropriate that the state or federal government in the initial stages of an industry does have a footprint in developing that industry. I would have no problem taking \$200,000 out of the lignite research fund.

Rep Skarphol: I agree with your concerns about where we're going with this. I understand the motivation behind it, I also understand that there are some safety issues involved with

storing hydrogen. I don't have any problems with Sections 1 and 2, but I do have a dilemma with section 3. Even if we pass it, I don't think NDSU is the place for it. I think it belongs with the Commerce Commission and they should decide who should be involved whoever he partner is.

Rep Nelson made a Do Pass motion

Rep Hawken seconded the motion

(yes) 15 (no) 8 (absent) 1

Carrier: Rep Scott Kelsh

Date: 2/16/07
 Roll Call Vote #: 1

2007 HOUSE STANDING COMMITTEE ROLL CALL VOTES
BILL/RESOLUTION NO. 1458

House Appropriations Full Committee

Check here for Conference Committee

Legislative Council Amendment Number _____

Action Taken Do Pass

Motion Made By Nelson Seconded By Hawken

Representatives	Yes	No	Representatives	Yes	No
Chairman Svedjan		✓			
Vice Chairman Kempenich	✓				
Representative Wald		✓	Representative Aarsvold	✓	
Representative Monson	✓		Representative Gulleason	✓	
Representative Hawken	✓				
Representative Klein	✓				
Representative Martinson	✓				
Representative Carlson		✓	Representative Glassheim	✓	
Representative Carlisle		✓	Representative Kroeber	✓	
Representative Skarphol		✓	Representative Williams	✓	
Representative Thoreson	✓				
Representative Pollert		✓	Representative Ekstrom	✓	
Representative Bellew		✓	Representative Kerzman	✓	
Representative Kreidt		✓	Representative Metcalf	✓	
Representative Nelson	✓				
Representative Wieland	✓				

Total (Yes) 15 No 8

Absent 1

Floor Assignment Rep. B. Kelsch

If the vote is on an amendment, briefly indicate intent:

REPORT OF STANDING COMMITTEE

HB 1458: Appropriations Committee (Rep. Svedjan, Chairman) recommends DO PASS
(15 YEAS, 8 NAYS, 1 ABSENT AND NOT VOTING). HB 1458 was placed on the
Eleventh order on the calendar.

2007 SENATE NATURAL RESOURCES

HB 1458

2007 SENATE STANDING COMMITTEE MINUTES

Bill/Resolution No. HB 1458

Senate Natural Resources Committee

Check here for Conference Committee

Hearing Date: March 8, 2007

Recorder Job Number: # 4690

Committee Clerk Signature



Minutes:

Senator Stanley Lyson, Chairman of the Senate Natural Resources Committee opened the hearing on HB 1458 establishing a hydrogen goal and relating to the duties of the commissioner of Commerce.

All members of the committee were present.

Representative David Monson of District 10 prime sponsor of HB 1458 introduced the bill (See attachment #1).

Senator Herbert Urlacher stated he had seen a TV program telling how this is already in practice and is growing in production and feasibility.

Representative Monson: agreed and that President Bush wants to see hydrogen as an important part of our energy system. As a teacher he used as science projects and class room demonstration. The fuel cells have made great strides and in conjunction with hydrogen there are possibilities. EERC is doing wonderful things in research development as hydrogen as a valuable fuel.

Senator Ben Tollefson added that one of the drawbacks of hydrogen is highly explosive.

Representative Monson agreed, and is also corrosive, is tough to store and is used in rockets.

Senator Joel Heitkamp questioned why not have the EERC do it?

Representative Monson answered that EERC does research and this is about getting a working filling station running so that vehicles can be used by the state and others. Fargo is the ideal location for the station.

Senator Heitkamp asked again that EERC did the research, they partner with the corporate world, so isn't that a better fix than asking for funding from the state.

Representative Monson answered that it is his understanding EERC has been working with a company in Minot. This is not just research but actual seed money to leverage other money to get a real fueling station. This is North Dakota contribution to that effort.

Senator Layton Freborg asked if there is a cost per mile using the hydrogen fuel.

Representative Monson answered he did not but a vehicle can not get very far because it does not give many BTUs. Fuel cells are being used which presents further range.

Brad Crabtree representing the Great Plains Institute testified in support of HB 1458 (see attachment #2). He also added that hydrogen is less explosive than gasoline and it was the skin of the Hindenburg that blow up and caught fire. The corrosive aspect of hydrogen is far more concern than the explosive issue. He also referred to the attachment of his testimony and stated the technology is ready to go and the primary rational is the acceleration of the commercialization not proving feasibility. There is a more ambitious companion bill in the Minnesota legislature making a \$10 million investment in hydrogen and developing a state wide road map.

Scott Handy representing the Cass County Electric Coop testified in support of HB 1458 stating the bill will put hydrogen on the streets in Fargo-Moorhead area where the company run a sizable vehicle fleet and would like to work with that fueling system. In the long run hydrogen is the key in solving the issue of being unable to store wind energy.

Senator Herbert Urlacher asked if there are any fleets in the US using hydrogen fuel at this time.

Scott Handy responded that Verendrye Cooperative in the Velva area is running some vehicles with hydrogen.

Senator Lyson added John Deere in Fargo is using a few pickup trucks on hydrogen.

Senator Lyson asked for testimony in opposition to HB 1458.

Senator Constance Triplett testified on the behalf of Gerald Groenewold, Director of the Energy & Environmental Research Center (EERC) in opposition to HB 1458 (see attachment # 3).

Senator Lyson asked for testimony in a neutral position of HB 1458.

Curtis Jabs representing the Basin Electric Power Cooperative testified in a neutral position of HB 1458 (see attachment # 4). He also distributed to the committee "Wind to Hydrogen" brochure. He further listed the experimental vehicles used in the state using hydrogen fuel.

Senator Herbert Urlacher inquired even if the product is light do not the containers of the hydrogen adds a lot of weight to the vehicle.

Curtis Jabs responded that the three hydrogen tanks occupy the entire pickup box, although he is not sure of the actual weight.

David Munsch testified that as a welder and comparing the hydrogen tanks to oxygen tanks with added pressure, the vehicle is a bomb going down the road. It is a safety issue with this concept.

Justin Dever, special assistant to the Commerce Department Commissioner and testifying on his behalf on HB 1458, stated section 2 of the bill gives the Department of Commerce a lead role in developing a the hydrogen road map. If the HB 1458 passes the commerce will work with the traditional and renewable energy industries along with the EERC.

2007 SENATE STANDING COMMITTEE MINUTES

Bill/Resolution No HB 1458

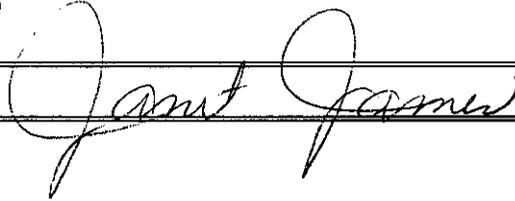
Senate Natural Resources Committee

Check here for Conference Committee

Hearing Date: March 9, 2007

Recorder Job Number: # 4759

Committee Clerk Signature



Minutes:

Senator Stanley Lyson, Chairman of the Senate Natural Resources Committee opened committee work on HB 1458.

All members of the committee were present.

Senator Constance Triplett made a motion for a Do Not Pass of HB 1458.

Senator Joel Heitkamp second the motion.

Senator Triplett: as she testified on her husband's Gerald Groenewold, Director of the EERC behalf she relayed to the committee that the center has nearing \$50 million of research occurring in the area of hydrogen. The notion in the bill of NDUS writing a road map does not make any sense for the legislature asking for a specific road map on some specific date is not realistic in an ever and quickly changing area. The amount of money being asked for one particular demonstration project does not make sense if we are trying to save money as there is tons of money coming in from private investments or many other hydrogen projects on the verge of being commercialized.

Senator Heitkamp; he said he asked why use the EERC and the answer was that they needed this money to build the station. If they want to build the station in Fargo, EERC will bring private industry to fund it. It should not be state dollars.

Senator Ben Tollefson: this is a duplication of effort.

Senator Triplett: agreed.

Senator Jim Pomeroy: living in Fargo and if this is the only place for fueling, he would not use this system.

Senator Triplett: the stations are referred to as fueling stations.

A roll call vote for a Do Not Pass of HB 1458 was taken indicating 7 Yeas, 0 Nays and 0 absent or not voting.

Senator Constance Triplett will carry HB 1458.

2007 SENATE STANDING COMMITTEE MINUTES

Bill/Resolution No. HB 1458

Senate Natural Resources Committee

Check here for Conference Committee

Hearing Date: March 12, 2007

Recorder Job Number: # 4827

Committee Clerk Signature



Minutes:

Senator Stanley Lyson, Chairman of the Senate Natural Resources Committee reopened committee work on HB1458.

All member of the committee were present except **Senator Ben Tollefson** and **Senator**

Herbert Urlacher.

Senator Lyson: distributed proposed amendments to the committee and reviewed the bill with the committee. The bill came out of committee as a Do Not Pass.

Discussion was held by the committee as to whether to reconsider the action of the committee.

Senator Lyson asked if the committee wanted to reconsider the committee's action on the bill.

Senator Jim Pomeroy made a motion to reconsider the action of the committee on HB 1458.

Senator Joel Heitkamp second the motion.

A voice roll call to reconsider the actions of the committee on HB 1458 indicated 0 Yeas, and 5 Nays. The motion failed and the previous action of Do Not Pass stands.

REPORT OF STANDING COMMITTEE (410)
March 12, 2007 9:23 a.m.

Module No: SR-46-4929
Carrier: Triplett
Insert LC: . Title: .

REPORT OF STANDING COMMITTEE

HB 1458: Natural Resources Committee (Sen. Lyson, Chairman) recommends DO NOT PASS (7 YEAS, 0 NAYS, 0 ABSENT AND NOT VOTING). HB 1458 was placed on the Fourteenth order on the calendar.

2007 TESTIMONY

HB 1458

Item #1
Energy & Environmental Research Center
University of North Dakota

House Natural Resources Committee
Todd Porter, Chairman
January 24, 2007
HB 1458

Mr. Chairman and Members of the Committee: My name is Gerald Groenewold and I am the Director of the Energy and Environmental Research Center (EERC) at the University of North Dakota. I am writing to oppose HB 1458.

In 2004, the EERC was designated by the U.S. Department of Energy as the National Center for Hydrogen Technology (NCHT). That designation was earned as a result of more than 50 years of hydrogen-related research and commercialization activities, including hydrogen production, dispensing systems, and utilization technologies (see attached brochures).

We are particularly pleased that the State of North Dakota recognized the EERC's National Center for Hydrogen Technology as one of the state's Centers of Excellence and, in 2006, provided \$2,500,000 to assist in construction of a new facility for our constantly-growing hydrogen programs. Those state funds have been leveraged with \$500,000 from the City of Grand Forks and the facility is nearing completion.

The EERC's global reputation in hydrogen research and technology commercialization has resulted in an ever-increasing number of contract awards in the past three years. Those awards total over \$30,000,000, with another \$14,000,000 pending (see attached list). EERC hydrogen programs currently in place involve partnerships with the energy industry, manufacturers, technology companies, farm organizations and commodity groups, the State of North Dakota, the U.S. military, key federal research agencies, universities, and non-profit organizations.

The EERC's hydrogen programs are all practical, market-driven activities, which are providing North Dakota with the unique capability to develop an extremely sophisticated, ever-evolving roadmap for our state.

I find it interesting that the bill recommends one of the deliverables be a "final roadmap by July 1, 2008." Any "roadmap" delivered on a specific date will certainly be outdated within a few months, because of the constant stream of major technological breakthroughs associated with hydrogen and fuel cell technology, many of them coming from the EERC.

Another goal of the proposed legislation is to appropriate funds to North Dakota State University for the purpose of "developing and deploying, in partnership with industry and the City of Fargo, a commercially promising hydrogen production system combined with

a specific end use or uses" for the next biennium. The EERC's NCHT is currently involved in several programs which are accomplishing that objective, in partnership with industry, using a wide variety of feedstocks and a wide variety of final use applications.

Another focus of the EERC's program is the development of new, innovative hydrogen dispensing systems. One of our long-term partners is Kraus Global, based in Winnipeg, MB, which is one of the world's leading developers and venders of alternative fueling systems. Air Products is another key EERC partner. Air Products is the largest commercial producer and distributor of hydrogen in the United States and the leading producer of both mobile and stationary hydrogen fueling stations in the United States.

The EERC is also the technical lead for the wind-to-hydrogen fueling system being developed in Minot in conjunction with Basin Electric Power Cooperative. The EERC has designed and built a mobile fueling system for the Grand Forks Army National Guard facility and we are currently designing a new hydrogen fueling system for the Grand Forks Air Force Base.

The EERC has already been very successful working with several leading hydrogen fuel cell manufacturers in developing, demonstrating, and now commercializing hydrogen fuel-cell-powered off-road vehicles, such as fork lifts and ice refinishers. The EERC is currently in negotiations with General Motors to become the national test site for GM's hydrogen fuel cell vehicles.

The requested legislation is an unnecessary duplication of an existing program, and, even if funded at the level requested, would be a very pale imitation of an existing robust program.

Item # 2

HB 1458: Establishment of State Hydrogen Goal, Development of State Hydrogen Roadmap and Support for a Fargo-Moorhead Hydrogen Production System

**Testimony to the House Natural Resources Committee
January 26, 2007**

**Brad Crabtree
Great Plains Institute
Ashley, ND
(701) 647-2041
bcrabtree@gpisd.net**

Thank you Chairman Porter and committee members for the opportunity to testify on behalf of HB 1458. I also want to thank Representative Monson, Representative Kelsh and the other bill sponsors for their recognition of North Dakota's potential for leadership in the hydrogen economy of the future.

My name is Brad Crabtree. I am program director of the Great Plains Institute, a nonprofit organization based in Minnesota and North Dakota. The Great Plains Institute staffs the Upper Midwest Hydrogen Initiative (UMHI), a public-private consortium whose membership includes Fortune 500 firms, smaller technology companies, and major research institutions from five Upper Midwest states and Manitoba. By advancing public policy, demonstration projects and education, UMHI works to accelerate the transition to a hydrogen economy and to maximize North Dakota's and the region's comparative advantage in hydrogen production from renewable energy sources and from the gasification of coal.

Through the Great Plains Institute, UMHI members have developed and presented an annual menu of hydrogen policy recommendations to the Legislators' Forum, a bi-partisan coalition of legislators from the Dakotas, Minnesota and Manitoba. Representative Monson serves as a North Dakota delegate to the Legislators Forum. Drawing on these regional recommendations last legislative session, we worked with Representative Monson, Representative Kelsh and other North Dakota legislators to pass HB 1496 that established a sales and use tax exemption for qualified hydrogen projects. We also sought, unsuccessfully, an appropriation to provide state cost share for a Fargo-Moorhead hydrogen fueling station.

HB 1458 seeks to build on legislative efforts last session and to take further steps consistent with recommendations broadly supported by industry and the research community throughout the region. This bill has also been endorsed by the North Dakota Renewable Energy Partnership.

Section 1 of this bill establishes a statutory hydrogen development goal for the state. While this may seem like a modest step, Minnesota established such a goal last session, and it has proved useful in focusing public and private efforts in hydrogen policy and projects.

Section 2 tasks the Department of Commerce to oversee development and implementation of a state hydrogen roadmap for achieving the statutory goal over time. The bill language provides clear direction regarding desired components of the roadmap, and similar roadmaps already prepared by the U.S. Department of Energy and several U.S. states can provide further guidance. The language also directs the Department to seek broad input from industry, agricultural interests, research institutions, nonprofit organizations and any other interested parties who wish to contribute. Finally, this section allows the Department to contract with a consultant to help develop the report.

In yesterday's hearings, Chairman Porter, other members of the committee and bill sponsors made frequent reference to the need and desire for a comprehensive approach to energy policy in our state. I commend that interest. In the realm of hydrogen, Section 2 of this bill would provide a vehicle for development of just such a comprehensive approach. Fortunately, hydrogen lends itself, indeed requires, an integrated approach to energy policy and projects since commercial technologies exist to produce hydrogen from all of North Dakota's energy sources, notably coal, wind, ethanol, biomass and hydropower.

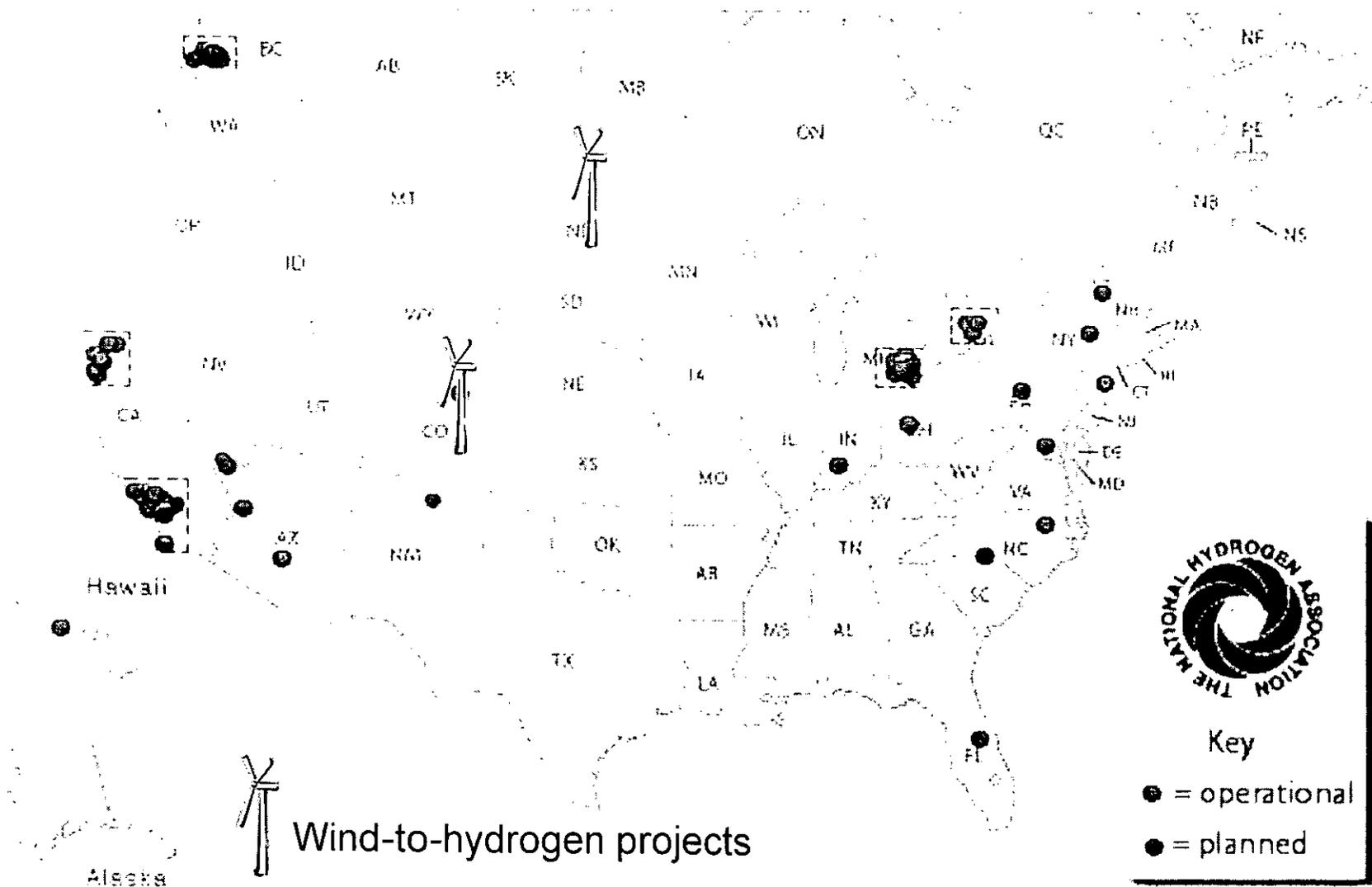
Section 3 authorizes an appropriation of up to \$200,000 to support the Department of Commerce's preparation of the roadmap and to provide state cost share to be combined with Minnesota state cost share, federal funding and private investment for a hydrogen production system in Fargo to serve Fargo, West Fargo and Moorhead. However, this section is about more than money. Members of UMHI have consistently stressed that one of the most important roles government can play at this time is support for visible demonstration projects to commercialize hydrogen production technologies for use in fleet vehicles and other equipment. While the technology is available, we are still early on the path toward commercialization, and such projects are not yet viable in the marketplace without public support.

The attached map shows that our region is largely being left behind in the development of hydrogen fueling stations, despite our potential to be North America's low-cost producer of hydrogen fuel. Fortunately, North Dakota has taken an important step with a wind-hydrogen project under development in Minot that involves a number of institutional partners. We now need to proceed with another hydrogen demonstration project in our state's largest metropolitan area, ideally located in close proximity to the junction of I-94 and I-29 in order to serve as an important hydrogen fueling point in a larger network of stations envisioned for our region's Interstate corridors. We have dubbed this network the "Northern H" with fueling stations proposed from Winnipeg to Sioux Falls in the west, Duluth to Des Moines in the east, and Fargo to Madison from west to east.

The cities of Fargo and Moorhead, the Fargo-Moorhead Chamber of Commerce, NDSU, Cass County Electric and Moorhead Public Service support this project, and more partners will be involved at the project design stage. The state of Minnesota is stepping up to the plate as well. Last session, \$600,000 was allocated for hydrogen stations, with Fargo-Moorhead being one of the intended locations. However, technical problems with the wording prevented those funds from being utilized. Now, major hydrogen legislation is about to be introduced by Senator Ellen Anderson that will not only fix the legislative language, but also request a major additional \$10 million state investment in hydrogen projects and roadmap development.

It is my hope that you will build on the exciting momentum this session to invest in North Dakota's energy future by adding the hydrogen commitments in this bill to the broader energy agenda. I respectfully request a do-pass recommendation on HB 1458.

72 Hydrogen Stations in North America



Hydrogen Fact Sheet

Minnesota Legislation: *Hydrogen Development Act of 2007*

1. **Requires the Department of Commerce to oversee the development and implementation of a hydrogen roadmap**, including appropriate technology deployments that achieve Minnesota's statutory hydrogen goal.

The roadmap must:

- a. Be compatible with the U.S. Department of Energy's *National Hydrogen Energy Roadmap*
 - b. Be based on an assessment of the state's opportunities in hydrogen, fuel cells and related technologies, so as to capitalize on Minnesota's strengths
 - c. Establish a vision, goals, general timeline and measurable milestones for achieving the state's hydrogen goal [§216B.013].
 - d. Describe how hydrogen and fuel cells fit in Minnesota's overall energy system, and help foster a consistent and predictable investment environment.
2. **Appropriates \$10.6 million to help prepare Minnesota to fully benefit from the emerging hydrogen economy**. The public cost share is intended to further develop, deploy, and encourage commercially promising hydrogen production systems and hydrogen end-uses in partnership with industry. Eligible expenditures are:
 - a. Development of the Roadmap;
 - b. Early deployment projects identified in DOC's most recent biennial report: *Strategic Demonstration Projects to Accelerate the Commercialization of Renewable Hydrogen and Related Technologies in Minnesota*.

Projects would be awarded through a competitive process and must receive 50 percent of their total cost from non-state sources (except for public institutions, such as institutions of higher learning).

3. **Requires the state to develop recommendations regarding the adoption of uniform codes and standards** for hydrogen infrastructure, fuel cells and related technologies.
<http://hosp.ansi.org/default.asp>
4. **Further encourage the state to make changes to its procurement guidelines and contracts** in order to facilitate the purchase and deployment of hydrogen, fuel cells, and related technologies by all levels of government when feasible.

Activity in Other States

- **47 states and the District of Columbia have some sort of fuel cell or hydrogen legislation, demonstration or activity taking place today.** These activities fall into one of five categories:
 1. **Plans/Strategies** – These include hydrogen and fuel cell roadmaps and blueprints, “clean energy” or “green” initiatives that include hydrogen or fuel cells, and hydrogen and fuel cell educational activities.
 2. **Standards/Regulations** – These include interconnection standards, net metering policies and detailed renewable portfolio standards that include hydrogen and fuel cells.
 3. **Public Agency Policies/Purchasing Programs** – This includes rules that promote the use of fuel cells or hydrogen technologies in state or municipal-owned facilities and vehicles.
 4. **Incentives/ Market Stimulation** – These include grants, loans, rebates and tax incentives that are offered to either individuals or businesses for the purchase and installation of fuel cell equipment.
 5. **Partnerships** – These are alliances of government, business and/or academia that are working together to develop hydrogen and fuel cell policy and are fostering research and demonstration activities.

Source: State Activities That Promote Fuel Cells and Hydrogen Infrastructure Development:
<http://www.fuelcells.org/info/StateActivity.pdf>

Hydrogen Refueling Stations and Vehicles

- **There are at least 72 hydrogen stations in North America.** Searchable Database of Hydrogen Stations in North America <http://www.hydrogenassociation.org/general/fuelingSearch.asp#null>
- **There 256 existing and planned stations worldwide.** Searchable Database of Existing and Planned Hydrogen Stations around the world:
<http://www.fuelcells.org/info/charts/h2fuelingstations.pdf>
- **Map of existing and planned hydrogen stations around the world:** <http://www.h2stations.org>
- **400 to 500 hydrogen vehicles have been deployed worldwide.** Database of Cars, Buses, Bikes and other vehicles: <http://www.h2mobility.org/>

Fuel Cell Installations

- There have been more than 2,000 fuel cells installed around the world since the early 1980s.
Searchable Database of Stationary Fuel Cell Installations around the world:
<http://www.fuelcells.org/db/>

Item #3

Written Testimony from Cass County Electric in Favor of HB 1458

Honorable members of the House Natural Resources Committee,

I am writing to express Cass County Electric Cooperative's support for HB1458, a bill your committee will hear at 8:30 am on Friday, January 26. It was a pleasure to address your committee today in support of HB1506, however, I needed to return to my regular job tonight and will not be able to appear personally for HB1458.

HB1458 establishes a state goal to develop hydrogen as an energy source. Research in hydrogen has been promoted heavily at a national level, and with our resources, we are poised to become a regional leader in hydrogen in North Dakota. Cass County Electric is very interested in innovative uses of energy, and would like to explore how hydrogen fits in with our utility operations. Among other opportunities, hydrogen may play a role in resolving the intermittency of wind energy by providing a way to store energy for times when the wind isn't blowing. Verendrye Electric Cooperative is already experimenting with how wind-produced hydrogen can be used as a motor fuel.

Let's take advantage of this opportunity to help our state be a leader in the development of hydrogen energy research and infrastructure. Your DO PASS recommendation on HB1458 is urged.

Scott Handy
President/CEO
Cass County Electric Cooperative Inc.
491 Elm St
Kindred, ND 58051
shandy@kwh.com

Item # 4

Fargo-Moorhead Chamber of Commerce Support for HB 1458

Representatives Kelsch and Clark and the Chair and Vice Chair of the House Natural Resources Committee,

I understand that on Thursday, the House Natural Resources committee will have a hearing on a bill relating to hydrogen development, HB 1458, and I wanted to take this opportunity to remind you of the perspective of the Chamber of Commerce of Fargo Moorhead related to this issue.

Our board for the 2007 Legislative agenda approved the following:

- Support legislation that fosters energy development & transmission and provides for diversity and security of energy resources including wind energy and **hydrogen**.

Please consider the perspectives of the nearly 1900 Chamber members at the Chamber of Commerce of Fargo Moorhead and the need for exploration and exploration of this new energy source both now and into the future. Thank you for all that you do.

Kelli Poehls

Public Affairs Coordinator

Chamber of Commerce of Fargo Moorhead

phone (218) 233-1100

fax (218) 233-1200

Item #3

**Curtis Jabs - Basin Electric Power Cooperative
North Dakota House Bill No. 1458
House Natural Resources
January 26, 2007**

Mr. Chairman and members of the committee, my name is Curtis Jabs and I am here representing Basin Electric Power Cooperative. Basin Electric supports hydrogen research in North Dakota. Hydrogen is uniquely suited for transportation use. Hydrogen can be created by a variety of resources and its clean-burning properties make it desirable as an alternative, renewable fuel.

Basin Electric has taken a lead in the state in research and development of hydrogen as a transportation fuel. In partnership with our members, U.S. Department of Energy, North Dakota State University (NDSU) North Central Research Extension Center and others, Basin Electric is constructing a project to convert wind power into hydrogen at the NDSU North Central Research Extension Center. The project will use renewable electricity produced by Basin's Minot Wind Project to run an electrolyzer to convert water into hydrogen and oxygen. The hydrogen will be stored on site for use as a transportation fuel and for operations at the NDSU North Central Research Center. Three 2006 GM Flexfuel pickups are already converted to run on hydrogen for Verendrye Electric Cooperative, Central Electric Power Cooperative, and the NDSU North Central Research Center. NDSU is also working on converting tractor to run on hydrogen for use at the Experiment Station.

HB 1458 would give the state a goal and the ability to define how other hydrogen projects could be developed across the state. The vision to replace our oil imports through renewable fuels like hydrogen to power our transportation infrastructure is a worthy goal.

This concludes my testimony and I would be open for questions.

Part of item 5
BASIN ELECTRIC POWER COOPERATIVE PROJECT

Hydrogen

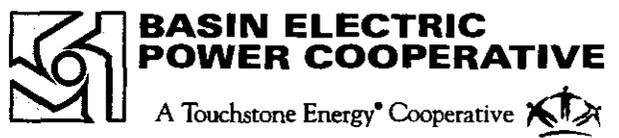
WIND TO



Project sponsors and participants:

- | | | | |
|------------------------------------|--|---|----------------------------------|
| Basin Electric Power Cooperative | Hydrogenics | Cooperative Research Network | Albert Kahn Associates, Inc. |
| U.S. Senator Byron L. Dorgan | AFV Tech, Inc. | N.D. Dept. of Commerce | DMA Technical Services, Inc. |
| U.S. Department of Energy | North Dakota State University (NDSU) | N.D. Dept. of Transportation | Butler Machinery |
| Central Power Electric Cooperative | NDSU North Central Research Extension Center | Energy & Environmental Research Center (EERC) | Ryan Chevrolet |
| Verendrye Electric Cooperative | | Hydrogen Engine Center | Electric Utility Supply Company |
| | | | North Prairie Rural Water Assoc. |

For more information contact:
Basin Electric Power Cooperative
1717 East Interstate Avenue
Bismarck, ND 58503-0564
701-223-0441



Basin Electric Power Cooperative, with U.S. Department of Energy funding arranged by U.S. Sen. Byron L. Dorgan, is working to develop a cutting edge research project to turn intermittent wind energy into a value-added energy source that can be stored and used as needed.

The Wind to Hydrogen project uses energy from Basin Electric's wind resources to produce hydrogen (H₂) through the electrolysis of water. Electricity from wind will be

dynamically scheduled over the electrical system to an H₂ electrolyzer located at North Dakota State University's North Central Research Extension Center south of Minot, ND. The electrolyzer will be operated through dynamic scheduling to match H₂ production with the ups and downs of wind energy.

The project also includes construction of a bulk H₂ storage system and H₂ fuel dispenser to allow for fueling of vehicles and equipment modified to burn H₂ fuel.

What is H₂?

H₂ gas is the simplest and lightest fuel. It can be created from a variety of resources.

How is H₂ made?

H₂ can be produced using electricity, nuclear power or by thermochemical processes from feed stocks such as gas, coal or biomass.

What is an electrolyzer?

An electrolyzer produces H₂ gas through the electrolysis of water using electricity to extract the H₂ molecules from water. The byproduct of this process is oxygen.

Wind to H₂ project cost:

Approximately \$2 million.

How will H₂ be used by this innovative project?

The H₂ fuel will be used to fuel three full-size pick-up trucks, a tractor, and an H₂ powered generator, which will generate electricity to the power grid during peak demand periods.

Electrolyzer facts:

- 1 kilogram of H₂ is equal to 1 gallon of gasoline
- Production of H₂ at full load: 64 kilograms per day
- Electrolyzer size: rated at 175 kilowatts
- Electricity needed to produce 1 kilogram of H₂: 60 kilowatt-hours
- Water needed to produce 1 kilogram of H₂: 5.8 gallons
- H₂ storage pressure: 6,500 psi

What are the benefits of H₂?

- Use of H₂ can help address concerns about energy security, global climate change and air quality.
- Increased energy efficiency
- Vehicle fuel
- Fuel cell applications

Is H₂ safe?

With proper knowledge and responsible handling, H₂ is no more or less hazardous than gasoline, propane or methane.

What about the Hindenburg fire?

The Hindenburg was coated with reactive chemicals, similar to solid rocket fuel, which was easily ignitable by an electrical charge. The outer cover, not H₂, is to blame for the fire.

*Energy & Environmental
Research Center*

EERC HYDROGEN PROJECTS

Summary of Projects since January 1, 2005

Updated: 1/20/07

	Project Cost	Federal Funding	Non Federal Cash	Cash Equivalent In-Kind
Funded Projects	\$ 26,698,879	\$ 17,484,978	\$ 7,194,551	\$ 2,019,350
Completed Projects	\$ 910,079	\$ 375,000	\$ 535,079	\$ -
NCHT Building	\$ 3,000,000	\$ -	\$ 3,000,000	\$ -
Total	\$ 30,608,958	\$ 17,859,978	\$ 10,729,630	\$ 2,019,350
Pending Projects	\$ 14,257,325	\$ 4,009,566	\$ 10,247,759	\$ -

EE HYDROGEN PROJECTS – FUNDED

Proposal No.	Project Title	Sponsors	EERC Contact	Start Date	End Date	Total Project Cost	Federal Funding	Nonfederal Cash*	Cash Equivalent In-Kind
2005-0285	Integrated Demonstration of JP-8-Based Hydrogen Production and Use in Military Fuel Cell Electric Hybrid Vehicles - Years 1 & 2	U.S. Army Corps of Engineers/e-Power	Aulich	7/1/2005	4/22/2008	\$2,217,650	\$2,182,650		\$35,000
2006-0195	NAFL -Phase 16 - Task 4 - Electrochemical Synthesis of Urea Fertilizer from Ethanol Coproducts CO ₂ and Coal Combustion NOx	USDA	Aulich	6/1/2006	5/31/2007	\$61,313	\$61,313		
2007-0029	Fuel Cell-Hybrid Powered Nontactical Vehicles and Demonstration	U.S. Army Construction Engineering Research Laboratory	Aulich	10/27/2006	4/26/2009	\$801,180	\$801,180		
2006-0274	Evaluation and Testing of CE-CERT Hydrogasification Process to Produce Liquid Fuels	University of California	Benson	7/15/2006	11/30/2006	\$147,738		\$147,738	
2007-0001	HydroMax Process Development with Diversified Energy	Diversified Energy Coporation	Benson	8/1/2006	9/30/2007	\$249,000		\$249,000	
2006-0162	Biomass 2006 – 1.1 - Integrated Thermochemical and Liquid Fuels Synthesis Process	U.S. DOE/Catacel	Folkedahl	7/1/2006	6/30/2007	\$89,450	\$60,000		\$29,450
2006-0162	Biomass 2006 – 1.2 -Engineering Analysis of an Indirect Liquefaction Process	U.S. DOE/Idatech	Folkedahl	7/1/2006	6/30/2007	\$257,000	\$193,000		\$64,000
2005-0217	National Center for Hydrogen Technology – Year 1	U.S. DOE/Siemens /Great River Energy/North Dakota Industrial Commission/TXU/ Air Products and Chemicals, Inc./ Idatech/SGL Carbon/Franklin Fuel Cells/ePower Synergies, Inc./ Resurface Corporation/Dynetek/ Nuvera/Enersis/Kraus Global Inc./Red River Valley Research Corridor/CEO Praxis/Xcel Energy/Ballard/Rio Tinto	Holmes	6/23/2005	12/31/2006	\$3,391,500	\$2,700,000	\$315,000	\$376,500
2006-0171	National Center for Hydrogen Technology – Year 2	U.S. DOE Siemens/Lignite Consortium/Air Products and Chemicals/Advanced Biomass Gasification Technologies	Holmes	6/23/2006	6/22/2007	\$3,169,082	\$2,250,000	\$919,082	

EERC HYDROGEN PROJECTS – FUNDED

Proposal No.	Project Title	Sponsors	EERC Contact	Start Date	End Date	Total Project Cost	Federal Funding	Nonfederal Cash*	Cash Equivalent In-Kind
2006-0152	Base 2006 (Year 9): 6.6 Transient Liquid-Phase Bonding of FeCrAl ODS Alloys Using Aluminum Foil	U.S. DOE	Hurley	4/1/2006	3/31/2007	\$70,000	\$70,000		
2007-0025	Joining of ODS FeCrAl Alloys	U of Tenn -Batelle	Hurley	8/31/2006	6/30/2007	\$80,835		\$80,835	
2002-0068 2002-0069	JV 46 – Development of Testing of an SOFC Gasification System	U.S. DOE Xcel Energy	Hutton	6/1/2002	1/30/2007	\$2,076,095	\$1,250,142	\$825,953	
2006-0152	Base 2006 (Year 9): 3.15 Hydrogen Production from High Temperature Sources	U.S. DOE	Olson	4/1/2006	3/31/2007	\$50,000	\$50,000		
2005-0050 2005-0303	Wind-to-Hydrogen Pilot Project	Basin Electric Power Cooperative	Schmidt	1/10/2005	12/31/2008	\$1,250,000		\$1,000,000	\$250,000
2005-0236	Wood Waste Electricity Generation System	BMC Construction	Schmidt	7/20/2005	12/31/2006	\$197,221		\$197,221	
2006-0162	Biomass 2006 – 3.1 - Education and Outreach Tools for Hydrogen and Alternative Fuels from Biomass	U.S. DOE/Multi	Schmidt	7/1/2006	6/30/2007	\$20,000	\$10,000		\$10,000
2006-0164	Gasification Project Assistance	Biomass Energy Solutions, Inc.	Schmidt	3/1/2006	2/28/2007	\$33,862		\$33,862	
2006-0181	Gasifier Demo – Fond du Lac Reservation	Fond du Lac College	Schmidt	9/18/2006	8/31/2007	\$49,438		\$49,438	
2007-0016	Advanced Biomass Gasification Technologies (ABGT) Commercialization	Xethanol Corporation	Schmidt	8/15/2006	8/31/2007	\$103,227		\$103,227	
2006-0161	Hydrogen Evaluation and Consortium Development	ND Division of Community Services	Stevens	7/1/2005	5/31/2007	\$30,000		\$30,000	
2005-0069	Advanced Gasification Mercury/Trace Metal Control with Monolith Traps	U.S. DOE Corning	Swanson	6/27/2005	12/31/2006	\$6,243,179	\$4,993,179		\$1,250,000
2005-0144	Base CA 2005 (Y8) – 3.13: Enhanced Hydrogen Production from Water-Gas Shift Using CO ₂ Sorbents	U.S. DOE	Swanson	4/1/2005	3/31/2007	\$240,000	\$240,000		
2005-0277	A Novel Slurry-Based Biomass Reforming Process	United Technologies Research Center	Swanson			\$872,919		\$872,919	
2005-0297 2005-0218	Advanced High-Temperature, High-Pressure Transport Reactor Gasification – Year 1	U.S. DOE North American Coal	Swanson	4/1/2005	12/31/2006	\$634,764	\$553,514	\$81,250	
2006-0019	SNG/Electricity Coproduction - Phase I	Research Triangle Institute	Swanson	4/10/2006	9/30/2007	\$86,498		\$86,498	
2006-0152	Base 2006 (Year 9): 4.4 Testing of Catalysts	U.S. DOE	Swanson	4/1/2006	3/31/2007	\$120,000	\$120,000		
2007-0102	2000-Hour Pilot-Scale Demonstration Test	Pratt & Whitney Rocketdyne	Almlie/Holmes			\$825,000		\$825,000	
TBD	Advanced Tactical Fuels - Year 3	U.S. Army Corps of Engineers	Aulich			\$2,000,000	\$1,800,000	\$200,000	

EERC HYDROGEN PROJECTS – FUNDED

Proposal No.	Project Title	Sponsors	EERC Contact	Start Date	End Date	Total Project Cost	Federal Funding	Nonfederal Cash*	Cash Equivalent In-Kind
2005-0319	Technical Support: High-Pressure Solids Coal Pump and Injector Demonstration	Pratt & Whitney Rocketdyne, Inc.	Weber	8/1/2005	12/21/2006	\$1,132,528		\$1,132,528	
2005-0202	Biomass 2005 – Activity 5: Process Integration for Economic Hydrogen Production from Ethanol	U.S. DOE/MN Corn Research Council/ND Corn Utilization Council/Chippewa Valley Ethanol Company/H ₂ Innovations	Wocken	6/1/2005	12/31/2006	\$199,400	\$150,000	\$45,000	\$4,400
TOTAL						\$26,698,879	\$17,484,978	\$7,194,551	\$2,019,350

HYDROGEN – EERC COMPLETED PROJECTS

Proposal No.	Proposal Title	Sponsors	EERC Contact	Start Date	End Date	Total Project Cost	Federal Funding	Non Federal Cash	Cash Equivalent In-Kind
2006-0199	Rio Tinto's Sodium Issues in Coal Gasification	Rio Tinto, Technical Services	Benson	4/1/2006	9/30/2006	\$23,250		\$23,250	
2006-0213	Support of Westmoreland Coal in Producing a FutureGen Facility Site	Westmoreland Coal Sales Company	Jones	3/20/2006	6/30/2006	\$130,000		\$130,000	
2003-0175-R1	Commercial Development of Biomass Gasification Technology	North Dakota Department of Commerce	Schmidt	6/26/2003	5/31/2006	\$75,000		\$75,000	
2005-0214	Gasification of Grass Seed Residue	Agricultural Utilization Research Institute	Schmidt	6/29/2005	2/28/2006	\$25,000		\$25,000	
2004-0147	Design, Construction, and Testing of a Metalloid Capture Device	Microbeam Technologies, Inc.	Swanson	8/1/2004	5/31/2006	\$243,629		\$243,629	
2004-0192	Biomass 2004 – Activity 1: Ethanol Processing for Hydrogen Production – System Integration	U.S. DOE/Minnesota Corn Growers Association/ Chippewa Valley Ethanol Producers	Wocken	7/1/2004	3/31/2006	\$106,200	\$80,000	\$26,200	
	Wahpeton Hydrogen Workshop	CEO Praxis	Wocken	2/1/2006	4/30/2006	\$12,000		\$12,000	
2004-0151	Base CA 2004 (Y7) – 3.11: FutureGen Technologies	U.S. DOE	Zygarlicke	4/1/2004	3/31/2006	\$295,000	\$295,000		
TOTAL						\$910,079	\$375,000	\$535,079	\$0

EEL HYDROGEN PROJECTS – PENDING

Proposal No.	Project Title	Sponsors	EERC Contact	Start Date	End Date	Total Project Cost	Federal Funding	Nonfederal Cash*	Cash Equivalent In-Kind
TBD	TRI Reformer Demonstration	TRI	Erickson			\$1,000,000		\$1,000,000	
2007-0101	Design and Construction of a Catalytic Reactor for Energy Conversion Devices, Inc.	Energy Conversion Devices, Inc.	Hajicek	12/1/2006	6/30/2007	\$119,675		\$119,675	
TBD	National Center for Hydrogen Technology – Year 3**	U.S. DOE/Air Liquide/Multi	Holmes			\$3,846,000	\$2,500,000	\$1,346,000	
2007-0060	Carbon-Based Fuel Cells-Experimental Investigations to Achieve High Power Densities	National Science Foundation	Hutton	1/1/2007	12/31/2008	\$321,977	\$321,977		
2006-0040	Demonstration of the Production of Clean High-Btu Gas from Biomass with a Downdraft Gasifier	EER-GC Corporation	Patel			\$26,600		\$26,600	
2006-0140	Biomass Gasification Testing for Cargill	Cargill Incorporated	Schmidt			\$167,036		\$167,036	
2006-0271	HydroMax Process Development	Diversified Energy	Stanislawski			\$611,200		\$611,200	
2005-0086	Testing of TDA Sorbents on a Transport Reactor Demonstration Unit Slipstream	TDA Research, Inc.	Swanson			\$76,357		\$76,357	
2005-0297	Advanced High-Temperature, High-Pressure Transport Reactor Gasification – Year 2	U.S. DOE Multi	Swanson			\$1,000,000	\$800,000	\$200,000	
2005-0315	Gasification Testing of Coal-Biomass Mixtures in a Fluidized Bed	North Carolina A&T State University	Swanson			\$50,000		\$50,000	
2006-0019	SNG/Electricity Coproduction - Phase II	Research Triangle Institute	Swanson			\$537,223		\$537,223	
2006-0273	JV -Advanced Conversion Testing of Bulgarian Lignites	Bulgarian Lignite Power Project	Swanson			\$694,979	\$387,589	\$307,390	
2006-0277	Pure Hydrogen Production Using Integrated Metal Membranes	Ida Tech, LLC	Swanson	1/1/2008	12/31/2008	\$149,715		\$149,715	
2006-0300	Design and Construction of a Bench-Scale Gasification System for Indian Oil Corporation	Unitel Technologies Inc.	Swanson			\$2,172,978		\$2,172,978	
2005-0319	Technical Support: High-Pressure Solids Coal Pump and Injector Demonstration – Task 2C	Pratt & Whitney Rocketdyne, Inc.	Weber			\$225,616		\$225,616	
2006-0073	High-Pressure Solids Coal Pump Demonstration	Pratt & Whitney Rocketdyne, Inc.	Weber	10/1/2006	3/31/2009	\$3,257,969		\$3,257,969	
TOTAL						\$14,257,325	\$4,009,566	\$10,247,759	\$0



EERC

Energy & Environmental Research Center

News Release

UNIVERSITY OF NORTH DAKOTA

15 North 23rd Street — Stop 9018 / Grand Forks, ND 58202-9018 / Phone: (701) 777-5000 Fax: 777-5181
Web Site: www.undeerc.org

For Immediate Release:

Tuesday, April 27, 2004

PRESS CONFERENCE APRIL 30, 2004, AT 9:00 A.M.

NEW CUTTING-EDGE TECHNOLOGY TO BE UNVEILED

(GRAND FORKS, N.D.) – A “zero emissions” vehicle prototype that could be used in combat zones or to move fighter jets on aircraft carriers will be on display at the University of North Dakota (UND) Energy & Environmental Research Center (EERC) on April 30, 2004, at 9:00 a.m.

The John Deere Fuel Cell-Powered Commercial Work Vehicle (CWV), similar to a four- or six-wheel all-terrain vehicle, will be displayed on the east patio of the EERC’s new facilities.

Comments will be given by EERC Director Gerald Groenewold, EERC Associate Director for Research Tom Erickson, and Deere & Company’s ePower Technologies Director, Bruce Wood. Colonel Mark Ramsay, Commander of the 319th Air Refueling Wing at the Grand Forks Air Force Base (GFAFB), has been invited to test drive the vehicle at 9:30 a.m.

“Deere & Company and the EERC are jointly pursuing opportunities to couple the CWV technology with the EERC’s proprietary on-demand hydrogen-dispensing technology,” said Groenewold. “The Grand Forks Air Force Base may be an ideal location for demonstration of this technology in the future.”

“Traditional versions of other John Deere vehicles have had tremendous success in military application,” said EERC Associate Director for Research Tom Erickson. “We anticipate the same with this new CWV.”

The CWV has a number of features of value to military flight line supervisors including a heavy-duty 1-ton load capacity with four-wheel electric drive, four-wheel electric steer, and a power inverter that allows it to divert its entire electric output to off-board power requirements. The CWV would be redesigned and resized to meet the requirements of the U.S. Air Force for towing, braking, load carrying, and aircraft starting.

The media event will be followed by a tour of the EERC at 10:00 a.m. with representatives from the Grand Forks Region Economic Development Corporation and the North Dakota Department of Commerce, including Director for Economic Development and Finance Linda Butts. They will be joined by representatives of Trammell Crow Company, based in San Jose, California, which works with clients to develop new expansion sites. The group is exploring new research opportunities in the state. Members of the media are also welcome.

-END-

For more information contact: Tom Erickson, EERC Associate Director for Research, at (701) 777-5153 or terickson@undeerc.org or Derek Walters, EERC Communications Manager, at (701) 777-5113 or dwalters@undeerc.org

NEWS RELEASE

BYRON DORGAN

UNITED STATES SENATOR ★ NORTH DAKOTA

13 Hart Senate Office Building • Washington, DC 20510 • <http://dorgan.senate.gov>

For Immediate Release
Wednesday
September 8, 2004

CONTACT: Sanjay Talwani
or Barry E. Piatt
PHONE: 202-224-2551

Dorgan secured funding for project to develop hydrogen fuel technology:

WIND-HYDROGEN PILOT PROJECT AWARDED \$497,000 FEDERAL GRANT

(WASHINGTON, DC) --- U.S. Senator Byron Dorgan (D-ND) announced Wednesday that a consortium of energy companies and research institutions in North Dakota has been awarded a federal grant of \$497,050 to undertake an innovative pilot program to produce, store and distribute hydrogen fuel. The project could be a major step toward efficiently producing hydrogen fuel using wind energy in North Dakota.

Dorgan, a member of the Senate Energy and Water Appropriations Subcommittee, secured the funding for the project during last year's appropriations process.

The consortium consists of Basin Electric Power Cooperative, the University of North Dakota Energy and Environmental Research Center (EERC), Stuart Energy, the North Dakota State University (NDSU) North Central Research Extension Center, Verendrye Electric Power Cooperative, and the City of Minot. These partners will contribute \$124,262 to the project.

"This project has enormous implications for the future of wind energy, hydrogen power, and economic growth in America's Heartland," said Dorgan, a national leader in the drive to bring hydrogen-powered vehicles and wind energy into mainstream use. "North Dakota is positioned to become a world leader in wind power, and North Dakota scientists are already doing some of the most important hydrogen technology work in the world. I'm pleased that the Department of Energy has recognized this project as an important part of its research program."

The project plan consists of two parts. The initial phase will analyze the economics and environmental impacts associated with the production of hydrogen fuel using wind turbines. The second phase, scheduled to begin in the spring of 2005, will include the placement of a hydrogen electrolyzer using "dynamic scheduling" with Basin Electric's wind energy farms to produce hydrogen for use as a vehicle fuel both on and off site. The hydrogen electrolyzer would be constructed at the NDSU North Central Research Extension Center with the support of Verendrye Electric.

The electrolyzer would be one of the nation's first sources of hydrogen from a renewable resource. The hydrogen could be used as a fuel source for both internal combustion and fuel cell vehicles as well as for electrical generation. The consortium is working with a number of entities to determine the best use of the hydrogen.

"We believe that this project can be an example for how the future might look," said Wayne Backman, Basin Electric's Senior Vice President of Generation. Backman noted that the project will provide a glimpse of some of the challenges and opportunities for the development of a hydrogen economy.

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NEWS RELEASE

BYRON DORGAN

UNITED STATES SENATOR ★ NORTH DAKOTA

713 Hart Senate Office Building • Washington, DC 20510 • <http://dorgan.senate.gov>

For Immediate Release
Friday
September 17, 2004

CONTACT: Barry E. Piatt
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PHONE: 202-224-2551

**Senator calls building expansion “important next step”
toward EERC’s growing future:**

**DORGAN ANNOUNCES \$3 MILLION IN HYDROGEN RESEARCH
FOR UND’S ENERGY & ENVIRONMENTAL RESEARCH CENTER**

(GRAND FORKS, NORTH DAKOTA) – U.S. Senator Byron Dorgan (D-ND) announced Friday he has secured an additional \$3 million this week for the Energy & Environmental Research Center (EERC) to conduct research on hydrogen technology development. The building expansion, and the new project are “vivid and real reminders that North Dakota’s role in federal research is growing and on the cutting edge,” said Dorgan, who has made creating a Red River Research Corridor a top priority in order to bring new, high paying jobs to the state.

Dorgan made the announcement at the dedication for EERC’s new building expansion project. He said he included money in the FY ’05 Interior Appropriations bill, which was approved by the full Appropriations Committee on Tuesday. The bill now goes to the full Senate where approval is expected.

“The development of hydrogen is very important to our country and its long-term energy future,” Dorgan said. “Through this project, EERC researchers will help our country work its way toward energy independence. The work they will do may well help revolutionize the way we fuel our automobiles, and help free us from our dangerous dependence on foreign oil. The EERC project will study ways hydrogen can be stored and used in vehicles and for other purposes.”

Dorgan said EERC’s new 47,000 square-foot expansion will provide EERC room to add an additional 90 researchers. “UND’s EERC is a key player in my Red River Valley Research Corridor initiative,” Dorgan said. “This expansion is an important next step in growing the Center’s capability and ultimately research expertise. I look forward to working with Dr. Groenewold and the EERC researchers to create new research opportunities in the future.”

-- END --

NEWS RELEASE



BYRON DORGAN

UNITED STATES SENATOR ★ NORTH DAKOTA

713 Hart Senate Office Building • Washington, DC 20510 • <http://dorgan.senate.gov>

For Immediate Release
Wednesday
July 6, 2005

CONTACT: Barry E. Piatt
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DORGAN SAYS HYDROGEN RESEARCH FUNDING PUTS EERC AT FOREFRONT OF THE DRIVE TO HYDROGEN ECONOMY

(GRAND FORKS, NORTH DAKOTA) – U.S. Senator Byron Dorgan (D-ND) announced Wednesday that action by the U.S. Senate last week will provide another \$3 million for hydrogen fuel cell research and development at the University of North Dakota's (UND) Energy and Environmental Research Center (EERC).

In the past year alone, Dorgan has secured a \$2.7 million grant for hydrogen fuel cell research work at the EERC and won designation of the EERC as a National Center for Hydrogen Technology. The \$3 million is another "big boost" toward putting the facility at the front line of research into a new source of fuel for the nation's transportation system, research that is full of economic development potential for the state, he said during a stop here.

"The EERC has done solid research for years on a wide variety of energy sources," Dorgan said. "For years I've been talking about the need to move toward a hydrogen fuel-cell economy, and now we are seeing that plan begin to take off. It's important work for our country, and I'm very pleased to see the EERC so centrally involved. Congratulations are in order for the staff at the EERC, whose work and dedication have earned Washington's confidence."

The Energy and Water Appropriations bill, which the Senate approved last week includes the \$3 million for hydrogen research at the EERC, money Dorgan secured as a member of the Appropriations Committee. The Energy Policy Act of 2005, also approved last week by the Senate, includes funding for hydrogen research and aggressive goals for development of the technology as a fuel source. Dorgan also earmarked \$1 million in the Department of Defense budget last year for the EERC to demonstrate the viability of supplying hydrogen fuel cell for the battlefield. He will push for additional funding for this project.

"If you look at the future of transportation, hydrogen is the most exciting new technology on the scene," Dorgan said. "Hydrogen may very well be the successor to the gasoline-powered cars we drive today, and the seeds for this new industry are being sown here at UND."

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EERC

Energy & Environmental Research Center

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UNIVERSITY OF NORTH DAKOTA

15 North 23rd Street — Stop 9018 / Grand Forks, ND 58202-9018 / Phone: (701) 777-5000 Fax: 777-5181
Web Site: www.undeerc.org

For Immediate Release:

Wednesday, October 19, 2005

EERC Awarded \$2.5 Million for New Hydrogen Facility

(GRAND FORKS, ND) – The Energy & Environmental Research Center (EERC) at the University of North Dakota (UND) was approved for a \$2.5 million award from the North Dakota Centers of Excellence Commission to build a new facility for the EERC's National Center for Hydrogen Technology.

The \$3 million, 15,000-square-foot facility is dedicated to the development and commercialization of hydrogen and fuel cell technologies and is expected to create between 50 and 100 new high-paying technical jobs and attract \$50 million in research contracts in the short term. It will be built to the west of the current EERC facilities on the UND campus.

"This award recognizes the value that the EERC holds in offering hundreds of quality jobs, partnerships with industry, and opportunities to spin off high-tech businesses in our region," said EERC Director Gerald Groenewold. "The EERC's National Center for Hydrogen Technology represents a significant partnership between the federal government, the state, private industry, and higher education and provides a cornerstone to address this nation's enormous challenge of developing new technologies which will guarantee this country's energy security for the long term—the EERC will make North Dakota proud."

The EERC submitted a proposal to the newly formed Centers of Excellence Commission in May 2005, the first proposal sent to the commission. The Centers of Excellence application required a 2-to-1 match of funds from non-state sources, but the EERC's proposal offered a 5-to-1 match, and over the next 5 years, it is expected to exceed a 20-to-1 match. The award will be matched with \$500,000 from the Grand Forks Growth Fund, which is managed by the Grand Forks Job Development Authority.

"We would like to thank the city of Grand Forks for its tremendous support and financial partnership," Groenewold said. "This new facility will house world-class activities which will draw global attention to Grand Forks and bring more world-class talent to our community."

The EERC was designated the National Center for Hydrogen Technology by the U.S. Department of Energy (DOE) in November 2004 in recognition of over 50 years of hydrogen research involving fossil fuels and renewable energy. U.S. Senator Byron Dorgan secured initial funding through DOE, that funding has been leveraged by numerous corporate partners, including Air Products and Chemicals, Chippewa Valley Ethanol, Basin Electric Power Cooperative, ePower Synergies, Inc., Hydrogenics Corporation, IdaTech, Pratt & Whitney Rocketdyne, SGL Carbon, Schunk-INEX, Siemens Energy Systems, and Xcel Energy.

The award will now go through three more levels of approval by the State Board of Higher Education, the North Dakota Department of Commerce Foundation, and the Legislative Budget Section before final disbursement of funds in early December.

Groenewold says construction on the National Center for Hydrogen Technology facility should begin in spring 2006, with anticipated completion in fall 2006.

-END-

For more information contact: **Derek Walters, EERC Communications Manager, at (701) 777-5113 or dwalters@undeerc.org.**

NEWS

FOR IMMEDIATE RELEASE
October 31, 2005

Contact: Don Canton or Don Larson
(701) 328-2200

HOEVEN HOSTS DEFENSE DEPARTMENT OFFICIALS EXPLORING EERC HYDROGEN TECHNOLOGY PROJECT EERC Recommended for \$2.5 million Centers of Excellence Award

GRAND FORKS, N.D. – Gov. John Hoeven today hosted a delegation from the U.S. Department of Defense (DOD) who are interested in military applications for several innovative alternative and renewable fuel technologies being developed at the Energy and Environmental Research Center (EERC). Of particular interest to the Pentagon are the EERC's various hydrogen technologies.

Joining Hoeven for a tour of the facility and discussions were Dr. Theodore Barna, Assistant Deputy Under Secretary of Defense; Dr. William Harrison III, Senior Advisor of the department's Clean Fuels Initiative in the Office of the Secretary of Defense; and EERC Director Dr. Gerald Groenewold.

"The EERC's focus on the practical and commercial application of hydrogen technology to fuel vehicles is a perfect match for the military, and a perfect match for our *Centers of Excellence* Program," Hoeven said. "The center's partnership with ePower Synergies, Inc. makes this a well rounded venture, linking the state, the university system and the private sector to create new jobs and new opportunities for North Dakotans."

The North Dakota *Centers of Excellence* Commission, the selection body for the Governor's *Centers of Excellence* program, recently recommended that the EERC be awarded \$2.5 million toward the building of a new \$3 million facility for its National Center for Hydrogen Technology (NCHT). The city of Grand Forks has also awarded the EERC \$500,000 to provide a total of \$3 million. An \$8 million to \$14 million match for the *Centers of Excellence* grant will be used for research activities at the new center. The 15,000-square-foot NCHT facility is expected to create 100 new high-paying technical jobs and attract \$50 million in research contracts in the short term. Construction is expected to begin in spring 2006.

The EERC was designated the National Center for Hydrogen Technology by the U.S. Department of Energy (DOE) in November 2004 in recognition of over 50 years of hydrogen research involving fossil fuels and renewable energy. The EERC currently has more than \$8 million in funding for hydrogen research, which includes \$2.9 million from DOE, and is leveraged by numerous corporate partners.

--MORE--

A major focus of the EERC's program is evaluating military applications of the EERC's hydrogen on-demand fueling system for producing hydrogen from JP-8 diesel fuel, which is used in all military vehicles. In addition to the development of this innovative hydrogen production technology, a fuel cell-powered forklift truck will be demonstrated at the Grand Forks Air Force Base and compared to a conventional propane-powered unit. The hydrogen technology could potentially be applied to thousands of DoD vehicles in the future. Project partners include DoD (U.S. Army and U.S. Air Force) and ePower Synergies, Inc., Cordova, Illinois.

"This is a unique example of an economic development partnership between the federal government, the state, private industry, and higher education, which leads to the creation of high-quality jobs and spin-off companies and draws on the world-class activities and talent at the EERC," said Groenewold.

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BYRON DORGAN

UNITED STATES SENATOR ★ NORTH DAKOTA

713 Hart Senate Office Building • Washington, DC 20510 • <http://dorgan.senate.gov>

For Immediate Release
Monday
October 31, 2005

CONTACT: Barry Piatt
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PHONE: 202-224-2551

Senator says North Dakota can play role in emerging hydrogen economy:

DORGAN TO BRING TOGETHER HYDROGEN ENERGY LEADERS FOR ACTION SUMMIT NOVEMBER 7 AT EERC

(WASHINGTON, D.C.) --- U.S. Senator Byron Dorgan (D-ND) announced Monday he will bring together business, academic and government leaders Monday, Nov. 7, at the University of North Dakota's Energy and Environmental Research Center (EERC) for a Hydrogen Energy Action Summit aimed at finding ways for North Dakota to take the lead in the emerging hydrogen economy.

Dorgan, whose work in promoting hydrogen research includes the designation last year of the EERC as a National Center for Hydrogen Technology, said the summit will foster an understanding of the current status of research, development and commercialization of hydrogen technology and help cultivate the Red River Valley Research Corridor as a hub of hydrogen research. Dorgan said he is pleased with the line-up of speakers at the event, which includes experts from ChevronTexaco, Xcel Energy, Ballard Power Systems, the U.S. Department of Energy and the National Hydrogen Association.

"Hydrogen is the most exciting technology we see in the future of energy and transportation. With the record-high gas prices and projected costs of heating our homes this winter, I can't think of a better time to be pushing toward a hydrogen fuel cell future," Dorgan said. "Hydrogen fuel cells have an unlimited potential for growth, and there's no reason the research for the industry can't be done here at the EERC in the Red River Valley Research Corridor. This Action Summit is a way to bring some of the country's leading hydrogen minds together to find out where we're headed and how our region can be a part of that growth."

Since Dorgan created the Red River Valley Research Corridor in 2002, he has directed more than \$225 million to universities and businesses in North Dakota. Much of that has supported hydrogen research. As a member of the Senate Energy Committee, he included \$3.75 billion in the recently passed federal energy bill for hydrogen research, some of it for projects in North Dakota. Earlier this year he also secured a \$2.7 million grant for fuel cell research at the EERC.

For more information or to register to attend the Action Summit, log on to <http://www.theresearchcorridor.com> or call Senator Dorgan's Fargo office at 701-239-5389.

--END--



EERC

Energy & Environmental Research Center

NEWS RELEASE

UNIVERSITY OF NORTH DAKOTA

15 North 23rd Street — Stop 9018 / Grand Forks, ND 58202-9018 / Phone: (701) 777-5000 Fax: 777-5181
Web Site: www.undeerc.org

For Immediate Release:

Friday, November 4, 2005

Press Conference set for 10:30 a.m. Monday, November 7, 2005

World's First Fuel Cell-Powered Ice Resurfacer to Be Unveiled at the EERC

(GRAND FORKS, ND) – The first-ever hydrogen fuel cell-powered ice resurfacer—a machine that smooths the surface of ice skating and hockey rinks—will make its world debut at the University of North Dakota (UND) Energy & Environmental Research Center (EERC) on Monday, November 7, 2005. The unveiling is part of the Hydrogen Energy Action Summit sponsored by U.S. Senator Byron Dorgan (D-ND).

The ice resurfacer, called the eP-Ice Bear, is being developed by ePower Synergies, Inc., a Cordova, Illinois-based company that develops transportation systems utilizing clean, sustainable energy, and the Resurface Corporation of Elmira, Ontario, manufacturer of Olympia and Ice Bear brand ice refinishers. The eP-Ice Bear ice resurfacer is ideal for indoor use because of its zero-emission powertrain that produces only water as a by-product.

The EERC's National Center for Hydrogen Technology is supporting the development of the system and leading the initial demonstration of the technology.

"The EERC's National Center for Hydrogen Technology is the cornerstone of our hydrogen efforts," said EERC Director Gerald Groenewold. "We currently have \$8 million in contracts funded through federal agencies and numerous private sector partners to support the development of technologies for hydrogen production and fuel cells. We anticipate up to \$50 million in contracts in the near term."

"We think it is very appropriate to debut the eP-Ice Bear at this event, as it shows what Senator Dorgan has been saying: that the hydrogen revolution is under way," said Bruce Wood, president of ePower. "This development of a near-commercial ice refinisher underscores the fact that the technology is ready, the hydrogen is available, and companies are developing products for commercialization."

The vehicle is anticipated to be introduced to the public in the near future at the world-class Ralph Engelstad Arena. After demonstrating the eP-Ice Bear and its fueling system in North Dakota, ePower Synergies will then exhibit the vehicle at the 2005 Electric Drive Transportation Association Conference in Vancouver, British Columbia.

"We are very proud that our Ice Bear is first. It is a no-compromise, high-performance machine with no harmful emissions," said Andy Schlupp, president of Resurface. "We also have the strong possibility of a near-term commercial sale."

In addition to ePower Synergies and the EERC, other project partners include Ontario-based HyMotion; Alberta-based Dynetek Corporation; Nuvera Fuel Cells, Cambridge, Massachusetts; and the U.S. Department of Energy National Energy Technology Laboratory.

-MORE-

"This project is an excellent opportunity to showcase our vast expertise in hydrogen technologies," said Tom Erickson, Associate Director for Research at the EERC. "We are also working with Kraus Global, Inc., of Winnipeg to supply the portable hydrogen re-fueling station for the eP-Ice Bear vehicle," he said.

Senator Dorgan's Action Summit, called "Building the Hydrogen Economy," begins at 8:30 a.m. on November 7 and will focus on a variety of topics, including hydrogen technologies for the transportation industry, hydrogen-powered unmanned aerial vehicles, and current activities in the region. The summit will be followed on November 8 by a training workshop focused on the fundamentals of the hydrogen industry. Register for both events at www.theresearchcorridor.com.

-END-

For more information contact:

EERC: Derek Walters, Communications Manager, at (701) 777-5113 or dwalters@undeerc.org.

ePower Synergies: Amy Nielsen, VP Communications, at (309) 654-9299, or amynielsen@frontiernet.net

Resurface: Lisa Schlupp, at (519) 669-1694, or lschlupp@resurface.com



BYRON DORGAN

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For Immediate Release
Monday
November 7, 2005

CONTACT: Barry Piatt
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Senator points to abundant evidence at Hydrogen Energy Action Summit:

DORGAN SAYS EFFORTS TO FOSTER HYDROGEN-BASED ECONOMY ARE PAYING OFF

(GRAND FORKS, NORTH DAKOTA) --- Surrounded by examples of hydrogen-powered technology put into application, U.S. Senator Byron Dorgan (D-ND) said Monday his once-distant vision of an economy based on hydrogen has evolved into a real-life revolution that is increasingly replacing outmoded technologies and being integrated into the everyday lives of millions.

Dorgan, presenting a plaque to Energy and Environmental Research Center (EERC) honoring its designation as a "National Center for Hydrogen Technology," said the EERC's research has been – and will continue to be – integral to the development of a hydrogen economy. But hydrogen has moved beyond the realm of research and into a state where it is increasingly being integrated to real-life situations, Dorgan said. With the targets and timetables Dorgan inserted in the federal energy bill that passed Congress this year – calling for 100,000 hydrogen-fueled vehicles on the road by 2010 and 2.5 million by 2020 – the technology will only become more common, he said.

"I've always said that if we have the leadership to set targets and the will to meet them, we can make progress very quickly," Dorgan said. "We're surrounded today by groups like the EERC and others, who looked at the way we power our vehicles and decided something needs to change. When we look at the future of transportation, hydrogen emerges as one of the most promising technologies that will help us shed our dangerous dependence on foreign sources of oil."

A long-time supporter of hydrogen technology, Dorgan's most recent work includes authoring a provision in the federal energy bill including \$3.75 billion for hydrogen research. Earlier this year, he secured a \$2.7 million grant for hydrogen research at the EERC.

Dorgan also worked to secure the EERC's designation as a "National Center for Hydrogen Technology," cementing its role in the rise of hydrogen power. The facility is an anchor in Dorgan's Red River Valley Research Corridor, to which he has directed more than \$225 million since 2002.

"I am proud of the work the EERC has done in this exciting field," Dorgan said. "The work done in this facility has helped propel us into the future of transportation at an amazing rate, and I look forward to the work we will see here in the future."

-- END --



EERC

Energy & Environmental Research Center

NEWS RELEASE

UNIVERSITY OF NORTH DAKOTA

15 North 23rd Street — Stop 9018 / Grand Forks, ND 58202-9018 / Phone: (701) 777-5000 Fax: 777-5181

Web Site: www.undeerc.org

For Immediate Release:

Wednesday, January 18, 2006

EERC Hydrogen Contracts to Total more than \$20 Million

(GRAND FORKS, N.D.) – Just weeks after North Dakota lawmakers approved the Centers of Excellence awards for research and job initiatives at universities around the state, the Energy & Environmental Research Center (EERC) at the University of North Dakota announced today its contracts related to hydrogen technologies are expected to total more than \$20 million within the next few months.

The EERC was awarded \$2.5 million as part of the Centers of Excellence program to build a facility for its National Center for Hydrogen Technology (NCHT). The Centers of Excellence application required a 2-to-1 match of funds from nonstate sources and a strong commitment from the private sector—the EERC's proposal offered a 4-to-1 match immediately and a projected 20-to-1 match over the next 5 years. Within the near future, the EERC will achieve close to a 10-to-1 match, with 60% of those funds derived from cash contracts with private industry sources. The EERC currently has hydrogen projects with over 15 U.S. and international private sector partners.

"The opportunities that Senator Byron Dorgan's support and the state's support of the Centers of Excellence program have brought to the EERC and North Dakota are absolutely phenomenal," said EERC Director Gerald Groenewold. "Numerous corporate partners have already verbally committed to bringing manufacturing and business opportunities to the Grand Forks area as our projects develop."

That will lead to more than 100 new private sector and private sector-equivalent jobs within the next 2 to 5 years locally and numerous others across the state, as well as spin-off companies spanning between the Minnesota and Montana borders.

Since submission of the original proposal to the Centers of Excellence Commission, the cash value of existing hydrogen projects at the EERC has grown from \$8 million to more than \$10 million. An additional \$13 million of near-term opportunities are in discussion with a variety of sponsors.

Corporate and federal partners involved in the anticipated new hydrogen projects include the U.S. Department of Energy (DOE); Siemens Power Generation, Inc.; Air Products and Chemicals, Inc.; Schunk-INEX; ePower Synergies, Inc.; Nuvera, and Pratt & Whitney Rocketdyne.

"These opportunities are just the beginning," said Groenewold. "The EERC has been developing hydrogen technologies for over 50 years. Current economic, political, and energy security drivers are creating a very strong market for the development of hydrogen technologies that will last for decades."

The EERC was designated as the National Center for Hydrogen Technology in November 2004 by the U.S. Department of Energy in recognition of over 50 years of hydrogen research involving fossil fuels and renewable energy. For more information, visit www.undeerc.org.

-END-

For more information contact: Gerald Groenewold, EERC Director, at (701) 777-5131 or ghg@undeerc.org.



EERC

Energy & Environmental Research Center

NEWS RELEASE

UNIVERSITY OF NORTH DAKOTA

15 North 23rd Street — Stop 9018 / Grand Forks, ND 58202-9018 / Phone: (701) 777-5000 Fax: 777-5181

Web Site: www.undeerc.org

For Immediate Release:

Monday, April 17, 2006

EERC Breaks Ground on \$3 Million Hydrogen Facility

(GRAND FORKS, NORTH DAKOTA) – Construction is under way on the Energy & Environmental Research Center's (EERC's) National Center for Hydrogen Technology facility. The EERC broke ground on the \$3 million facility today and expects completion sometime late this fall.

Speakers at the groundbreaking ceremony included EERC Director Gerald Groenewold; Governor John Hoeven (R-ND); Senator Kent Conrad (D-ND); Senator Byron Dorgan (D-ND); North Dakota University System Chancellor Robert Potts; Grand Forks Mayor Michael Brown; East Grand Forks Mayor Lynn Stauss; Grand Forks Region Economic Development Corporation President and CEO Klaus Thiessen; and Grand Forks City Council President/EERC Foundation Secretary-Treasurer Hal Gershman.

The 15,000-square-foot facility will allow the EERC to capitalize on the tremendous growth in hydrogen-related projects at the EERC. The facility will significantly enhance the strategic research, development, testing, and commercialization of hydrogen and fuel cell technologies and result in 50 to 100 new, high-paying private sector-equivalent jobs at the EERC. An additional 50 to 100 new private sector jobs in the greater Grand Forks region will also evolve as these projects progress.

Funding for the facility is being provided by the North Dakota Centers of Excellence Commission, which awarded the EERC \$2.5 million, and the city of Grand Forks, which provided \$500,000 in matching funds.

"This facility represents a significant partnership between the federal government, the state of North Dakota, the city of Grand Forks, private industry, and the EERC and provides a cornerstone to address the nation's enormous challenge of developing new technologies that will guarantee our energy security for the long term," said EERC Director Gerald Groenewold.

A 30-foot-high demonstration/testing area will be located inside the building, along with a staging area for vehicle demonstration, a fuel cell testing area, a high-temperature materials lab, and other individual labs for a variety of hydrogen production technologies. The building is being designed by Schoen & Associates.

"This building will be a specialized state-of-the-art facility to provide solutions for the world's growing energy needs while, at the same time, provide opportunities for regional economic growth," said Associate Director for Research Tom Erickson.

The EERC was designated the National Center for Hydrogen Technology by the U.S. Department of Energy (DOE) in November of 2004 in recognition of over 50 years of hydrogen research involving fossil and renewable energy. Senator Dorgan secured cornerstone research funding, which has been leveraged by numerous corporate partners.

The EERC has more than \$20 million in current hydrogen contracts in place. An additional \$20 million of near-term opportunities are in discussion with a variety of sponsors, for a total of \$40 million.

–END–

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Web Site: www.undeerc.org

For Immediate Release:
Monday, June 19, 2006

Fuel Cell-Powered Forklift Truck on Display at the EERC

(GRAND FORKS, NORTH DAKOTA) – The Energy & Environmental Research Center (EERC) at the University of North Dakota and ePower Synergies, Inc., announce the arrival of their second fuel cell-powered vehicle: a new Hyster forklift truck. The forklift is currently on display at the EERC.

This new vehicle is the result of a partnership between the U.S. Army Corps of Engineers Construction Engineering Research Laboratory, ePower Synergies, the U.S. Air Force, and the EERC to develop fuel cell vehicles and a portable hydrogen production and refueling system for military applications. The truck offers high performance quiet operation with no carbon monoxide or other harmful emissions.

“Hydrogen fuel cell technology is now, not tomorrow,” stated EERC Director Gerald Groenewold. “The key is to demonstrate that hydrogen vehicles are commercially and technologically viable and safe. Off-road applications are just the first wave—the EERC and its corporate partners are involved in the development of a variety of off-road hydrogen fuel cell vehicles, which are providing a cornerstone for deployment of hydrogen fuel cell-powered highway vehicles.”

Because the fuel cell forklift will be operating both inside and outside, and on a variety of surfaces, a European-produced pneumatic-tired, high-power, 80-volt drive system Hyster was selected for the transformation. “Because it’s a European-based vehicle, this application will provide us with very useful feedback and experience for our subsequent growth outside North America,” said Frank Trotter, president and COE of General Hydrogen, manufacturer of the fuel cell used in the Hyster forklift (based in Richmond, British Columbia, near Vancouver).

“One objective of this project is to evaluate the performance of a hydrogen fuel cell-powered forklift against a forklift powered with an internal combustion engine fueled with propane,” said Bruce Wood, president of ePower Synergies. “Customers typically prefer propane-powered units as they deliver higher performance than battery electric units, but when noise and engine emissions are a problem, they use the battery-powered units. This fuel cell-powered forklift offers the best of both, and unlike the hours it takes to properly charge lift truck batteries, the fuel cell can be refueled in less than 5 minutes.”

ePower Synergies is a developer of clean vehicles and personal mobility systems based in Cordova, Illinois, with an office in Portland, Oregon. This is the second fuel cell-powered vehicle unveiled within the past year at the EERC. The world’s first hydrogen fuel cell-powered ice resurfer, the eP-ICEBEAR, was introduced in November 2005.

The forklift is expected to go into service for at least 1 year at the North Dakota Army National Guard Base in Grand Forks, North Dakota, and will be officially unveiled in early July. Both the eP-Ice Bear and the Hyster Forklift will be on display at the North Dakota State Fair, July 21–29, 2006, in Minot, North Dakota.

Disclaimer: This project is sponsored in part by the U.S. Department of Defense. The information provided in this document does not necessarily reflect the position or policy of the U.S. Government, and no official endorsement has been made.

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Web Site: www.undeerc.org

For Immediate Release:

Friday, July 14, 2006

Hydrogen Vehicle Showcase Comes to North Dakota State Fair, July 21–29, 2006

(GRAND FORKS, NORTH DAKOTA) – The Energy & Environmental Research Center (EERC) at the University of North Dakota (UND), along with a group of utility and private sector partners from around North Dakota, will showcase several aspects of the sustainable hydrogen economy, including up to six hydrogen vehicles, at the North Dakota State Fair July 21–29, 2006.

“The goal is to inform the public about the wide array of projects occurring around the state and in the upper Great Plains with respect to hydrogen fuel cell technologies and the regional programs and opportunities that are under way,” said Kirk Williams, Research Engineer at the EERC and project manager. “All aspects of hydrogen will be explained, from how it is made to how it is dispensed and used in vehicles,” he said.

Hydrogen (H₂) is the main component of water (H₂O) and is the most abundant element in nature. A hydrogen fuel cell operates like a rechargeable battery. However, it does not run down or require charging. It uses hydrogen and oxygen in an electrochemical process that generates electricity and heat while emitting only water vapor as a by-product.

Many of the hydrogen vehicles on display are in use today. Vehicles will be displayed in several locations. An inside display located in the Commercial I exhibit building will feature the eP-Ice Bear, the world’s first fuel cell ice resurfacers; a Hyster forklift truck; a Global Electric Motorcar (GEM); and a hydrogen-fueled internal combustion engine.

Other vehicles expected to be displayed throughout the fairgrounds include three hydrogen-powered Chevrolet Silverado 4x4 half-ton pickup trucks, a portable hydrogen refueler, and the UND School of Engineering and Mines fuel cell car. Several of these vehicles will be driven in the opening State Fair parade on Saturday, July 22.

“Hydrogen fuel cells are here today—they are not tomorrow’s technology,” said EERC Director Gerald Groenewold. “The only question is, how fast are we going to deploy them in our workplaces and on our roadways?” he said.

The State Fair hydrogen showcase is presented by the EERC’s National Center for Hydrogen Technology (NCHT); the U.S. Department of Energy National Energy Technology Laboratory; Prairie Public Broadcasting, Inc.; the North Dakota Department of Commerce Division of Community Services; Basin Electric Power Cooperative; Verendrye Electric Power Cooperative; the North Dakota Association of Rural Electric Cooperatives; Hydrogen Engine Center; ePower Synergies, Inc.; the Minot Area Chamber of Commerce; the North Dakota State Fair; and Cal-Dak Cabinets, Inc.

Disclaimer: Portions of this project are sponsored in part by the U.S. Department of Defense and the U.S. Department of Agriculture. The information provided in this document does not necessarily reflect the position or policy of the U.S. Government, and no official endorsement has been made.

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Web Site: www.undeerc.org

For Immediate Release:

Wednesday, January 17, 2007

EERC Demonstrates Hydrogen Production at Ethanol Facilities

(GRAND FORKS, NORTH DAKOTA) – The Energy & Environmental Research Center (EERC) at the University of North Dakota is leading a project to demonstrate the production of hydrogen at existing and future ethanol facilities in a unique, economical way, providing a near-term path toward a hydrogen economy. The hydrogen produced could be used on-site in fuel cells to provide additional power for the plant or as fuel for hydrogen vehicles.

“Hydrogen production integrated with an ethanol facility will provide an important source of renewable energy for both stationary and transportation fuel cell applications in a hydrogen-based economy,” said Chad Wocken, EERC Research Manager. “This technology will help facilitate regional and national growth in hydrogen utilization.”

Under the multiyear contract, the EERC’s Centers for Renewable Energy and Biomass Utilization are testing the technical feasibility of integrating hydrogen production with ethanol production. Activities include optimizing the ethanol-reforming process, demonstrating utilization of the produced hydrogen for power generation, optimizing the design for future ethanol plants, and conducting a full economic evaluation of the technology.

The information gathered from these efforts will be used to better define system integration, energy input, and the operational conditions required to produce hydrogen at an ethanol facility. The hydrogen becomes either a low-cost energy source for the facility or a value-added product enhancing the overall facility’s economics.

“Ultimately, numerous cost savings can be realized through integration of heat, power, and distillation systems within an ethanol plant,” said Wocken. “Additionally, if coupled with a fuel cell, overall plant efficiency could be improved.”

“The EERC’s renewable energy programs are leading the nation in expanding the use of agriculture products and by-products for the production of electricity, heat, and fuels,” said EERC Director Gerald Groenewold. “This program is focused not only on the ethanol industry, but also on the future energy path of the United States.”

Project partners include the U.S. Department of Energy, the Minnesota Corn Research & Promotion Council, the North Dakota Corn Utilization Council, Chippewa Valley Ethanol Company, and H₂Gen Innovations.

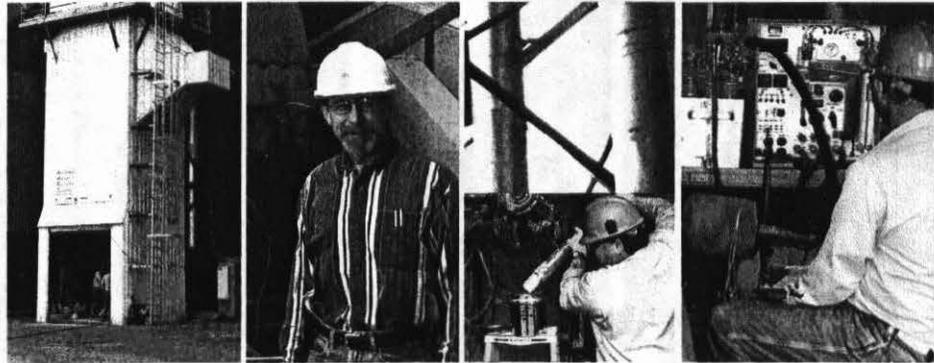
The EERC will highlight this research project as well as many other efforts in renewable fuels and energy during the North Dakota Department of Commerce Renewable Energy Day, January 19, 2007, at the State Capitol Building in Bismarck, North Dakota. The event runs from 8 a.m. to noon.

–END–

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EERC Centers of Excellence Leading the World



The commercialization of innovative technologies is essential to new wealth, new jobs, and economic prosperity. It is critical to the success of the Energy & Environmental Research Center (EERC) at the University of North Dakota and key to North Dakota's future.

The EERC and its multidisciplinary team of over 290 highly skilled scientists, engineers, and support staff, representing 120 disciplines, are recognized internationally for their dedication to improving the global quality of life. Through ten distinct Centers of Excellence, initiated to provide solutions to strategic energy and environmental issues, the EERC is researching, demonstrating, and commercializing scientifically advanced energy systems and innovative technologies to prevent and clean up air, water, and soil pollution. Many of these Centers of Excellence are recognized as the premier facilities in their respective fields by organizations including the U.S. Department of Energy (DOE), the U.S. Environmental Protection Agency (EPA), and the U.S. Department of Agriculture (USDA), among others.

Through its Centers of Excellence, the EERC, with its federal and corporate partners, is committed to moving technologies out of the laboratory and into the marketplace to further economic development, expand opportunities for research and manufacturing, and evolve quality jobs.

Coal Utilization Technologies Center

The EERC has been developing and enhancing clean coal technologies for over 50 years and is the world's leading research, development, demonstration, and commercialization center for coal, with special emphasis on low-rank coal. EERC research and development programs are designed to embrace all aspects of energy-from-coal technologies from cradle to grave, beginning with fundamental resource characterization and ending with waste utilization or disposal. Today's energy and environmental needs typically require the expertise of a total-systems team that can focus on technical details while retaining a broad perspective. The EERC's expertise in coal gasification provides unique opportunities for developing innovative approaches to produce hydrogen, synthetic natural gas, and liquid fuels from coal.

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Emission Control Technologies Center

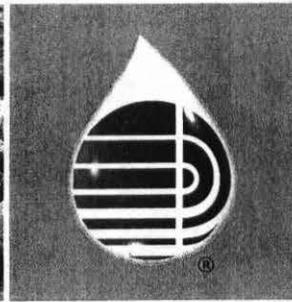
The EERC is internationally recognized for its groundbreaking work in the development of control technologies to reduce emissions from mobile and stationary sources worldwide (SO_3 , NO_x , SO_2 , and CO_2), mercury, and fine particulate matter. The EERC's Emission Control Technologies Center has conducted hundreds of industry-driven projects ranging from fundamental studies of system interactions to pilot- and full-scale slipstream testing of advanced technologies that offer solutions to meet clean air requirements well into the next century.

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Water Management Center

Water is key to economic development, with sufficient quantities of clean water necessary to sustain agricultural, industrial, commercial, and municipal activities. The Water Management Center addresses critical technical water management issues ranging from water resource assessments to water and wastewater treatment to flood mitigation and drought planning. The cornerstone of the Water Management Center is the Red River Water Management Consortium (RRWMC®). The RRWMC was established by the EERC in 1996 as a partnership between its members—representing industry, municipalities, counties, and other interested entities—along with state and federal government to address water quantity and quality in the Red River Basin for continued economic development of the region. To date, this activity has provided the foundation for the region's largest and most active water resource program.

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National Alternative Fuels Laboratory® (NAFL®)

Established in 1988 with support from USDA, the National Alternative Fuels Laboratory is committed to the commercial utilization of alternative fuels. NAFL has conducted over \$7 million of work aimed at the development of ethanol- and biodiesel-blended gasoline and diesel fuels and the determination of fuel use effects on health and the environment. NAFL was instrumental in the first successful development and certification of an environmentally friendly ethanol fuel for use in the aviation industry. Other NAFL fuel-related research, development, and demonstration activities include opportunity fuels and chemicals from agricultural processes and hybrid agriculture power-biofuels industrial plants.

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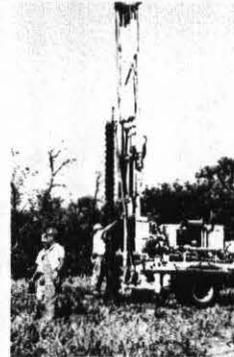
Supercritical and Subcritical Extraction Technologies Center

The EERC has been conducting groundbreaking work for more than 19 years to understand the chemistry of water and carbon dioxide under pressurized super- and subcritical conditions. The EERC is a world leader in manipulating the properties of subcritical water to allow for selective extraction, separation, and destruction or sequestration of select organic chemicals. Extraction technologies have been applied to flavor and fragrance compounds, antioxidants, and pharmaceutical compounds from plants; contaminants from soils; polymer additives from packaging materials; destruction of explosives; mimicking the bioavailability of pollutants in soils; and dechlorination of polyvinyl chloride.

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Coal Ash Research Center

Since 1986, the EERC Coal Ash Research Center has focused on developing, demonstrating, and commercializing environmentally friendly uses for coal ash—a by-product of burning coal to generate electricity. The Coal Ash Resources Research Consortium® (CARRC®) (pronounced "cars") is the cornerstone of those efforts. More than 100 million tons of coal combustion by-products is produced each year, but only 30% is used. Recently, the EERC launched a large study to determine how much mercury is released from coal ash when it is disposed of or used as raw material in products such as concrete.

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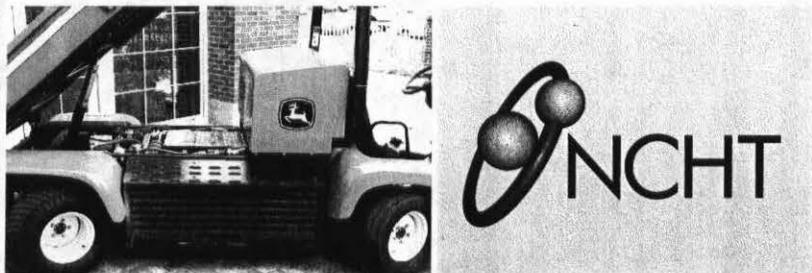
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The National Center for Hydrogen Technology

The EERC was designated in November 2004 as the National Center for Hydrogen Technology (NCHT) by DOE. The EERC has the experience, expertise, and facilities to take a lead role in developing, in concert with its industry and government partners, all aspects of the hydrogen economy. The EERC has more than 50 years of experience with hydrogen production and fuel cell technologies and is leading the way in integrating technologies for the production and use of hydrogen as a practical fuel. Current and pending contracts in the NCHT include more than \$40 million in funding for producing clean hydrogen from fossil fuels; developing innovative hydrogen production systems and vehicles tailored to the U.S. military; producing hydrogen from renewable sources; expanding the use of ethanol with new technologies that produce pure, clean hydrogen from ethanol plants; developing the hydrogen-dispensing system of the future; and integrating new technologies for hydrogen fuel cell vehicles.



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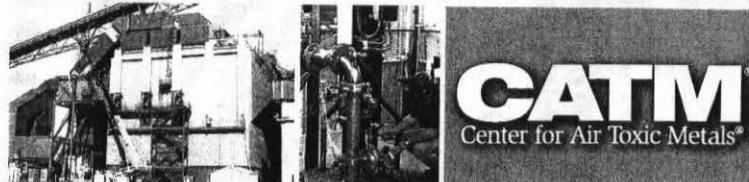
Center for Climate Change and CO₂ Sequestration

The EERC is one of the leading organizations selected by DOE to determine the best ways to reduce and/or manage CO₂ emissions. The EERC's Plains CO₂ Reduction (PCOR) Partnership is one of seven lead organizations in North America developing methods to meet the President's Global Climate Change Initiative. The PCOR Partnership incorporates the participation of more than 50 public and private sector stakeholders to identify significant sources of CO₂ in the central interior of North America and to evaluate the technical and economic feasibility of capturing and storing CO₂ in the region. Contract awards valued at nearly \$25 million are advancing commercialization of climate change mitigation technologies to capture and permanently store greenhouse gases.

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Center for Air Toxic Metals® (CATM®)

Designated by EPA in 1993 as the Center for Air Toxic Metals (CATM), the EERC is leading the world in developing effective strategies to understand and control mercury and other air toxic metal emissions. Working in partnership with EPA in the late 1990s, CATM established and validated methods of sampling and analysis for mercury that are now accepted worldwide. CATM has leveraged \$15.7 million of directed funding from EPA into nearly \$90 million in cofunded and related projects in partnership with other agencies and private industry.

Through CATM efforts, the EERC is also leading a series of full-scale programs with U.S. and Canadian utilities to demonstrate new mercury control technologies. CATM has also been instrumental in identifying the mercury measurement and mercury control issues critical to North Dakota's \$1.7 billion lignite-fired energy industry.

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Center for Renewable Energy

The EERC's Center for Renewable Energy is a worldwide leader in developing technologies for, and promoting the use of, biomass, wind energy, and alternative fuels. The EERC is currently advancing technologies for producing ethanol, biodiesel, and other valuable chemicals; turning forest and agricultural residues into a valuable resource for heat and power production; integrating biomass gasification with state-of-the-art solid oxide fuel cell technologies; creating a suite of new fuel formulations for aviation and transportation; and advancing new technologies to provide liquid fuels for battlefield and domestic military operations from renewable indigenous sources. The EERC's Plains Organization for Wind Energy Resources® (POWER®) is a leader in aiding the development of wind resources in the central and northern Great Plains. POWER serves as a regional clearinghouse for information and online data on this clean and renewable energy source. It is currently leading a commercial demonstration producing hydrogen from wind in Minot, North Dakota, and is developing approaches to enhance wind transmission and provide a platform for green credit-trading opportunities.



Contacts:

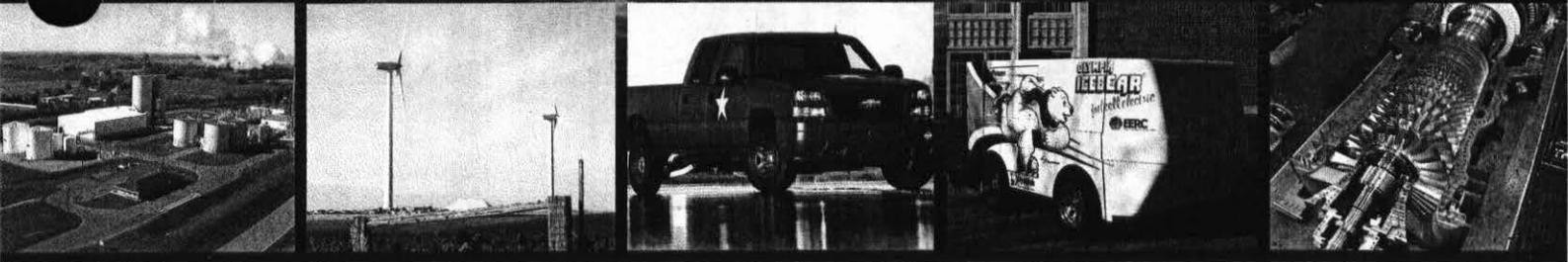
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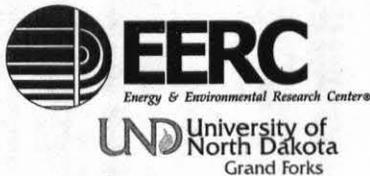
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HYDROGEN

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The hydrogen economy has the ability to significantly decrease our dependence on foreign oil while at the same time decreasing the environmental impact of energy technologies. A true hydrogen economy requires both inexpensive, plentiful sources of hydrogen as well as advanced technologies for using the hydrogen. The state of North Dakota is leading the way in developing and demonstrating both hydrogen production and hydrogen utilization technologies. These technology advances are providing real hydrogen utilization opportunities today that will pave the way for the hydrogen economy.

Hydrogen Production

Engineering practical technologies to extract hydrogen from North Dakota's plentiful natural resources and agricultural products

Hydrogen is the most abundant element on Earth; however, it does not exist in a pure form. Hydrogen is produced from a variety of energy resources including coal, oil, natural gas, agricultural products (biomass), water, wind, and solar energy. With North Dakota's incredible resources of coal, oil, agricultural products, and wind energy, it is poised to be a significant provider of hydrogen. North Dakota already has numerous hydrogen production activities under way.

Producing Hydrogen from Coal

The Energy & Environmental Research Center (EERC) National Center for Hydrogen Technology (NCHT) is working with numerous industry partners to develop coal gasification systems to produce inexpensive, hydrogen-rich gas. The Great Plains Synfuels Plant in Beulah, North Dakota, is a national example of coal gasification today.

Hydrogen from Military Fuels

The EERC NCHT has partnered with the U.S. Army Corps of Engineers Construction Engineering Research Laboratory, ePower Synergies, Inc., and the U.S. Air Force to develop specialized techniques to produce hydrogen from military fuel (JP8) for on-demand hydrogen on the battlefield. This will be demonstrated at the Grand Forks Army National Guard Base and the Grand Forks Air Force Base.

Hydrogen from Biomass

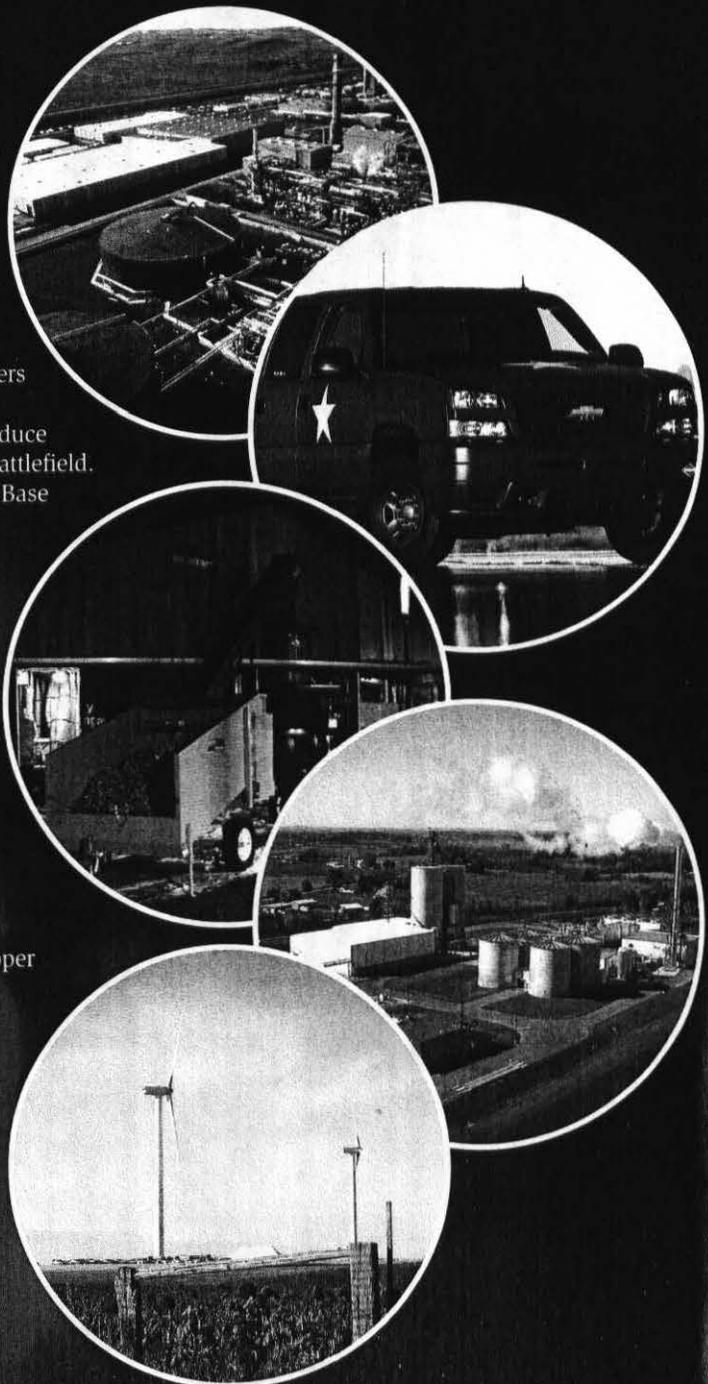
The EERC's trailer-mounted portable biomass gasification power plant is designed to convert a variety of plant materials to a hydrogen-rich gas similar to natural gas. This gas can be fed into turbines, piston engines, and boilers for low-cost power, or it can be used as a source of hydrogen. This mobile unit is designed for remote power generation where traditional fuel is unavailable or expensive. This technology is quickly advancing to commercial demonstrations.

Coproduction of Hydrogen and Ethanol

There is a growing number of ethanol production facilities in the upper Great Plains. A new technology being developed at the EERC could expand the use of ethanol from corn, with a process that produces clean hydrogen as part of the ethanol production process.

Wind-to-Hydrogen

The U.S. Department of Energy, in partnership with Basin Electric Power Cooperative, the EERC, and many others, is demonstrating the production of hydrogen from water using renewable wind energy near Minot, North Dakota. State-of-the-art wind turbines change wind into electrical energy. Electricity is used to split water into hydrogen and oxygen in an electrolyzer. The hydrogen is pressurized and stored to fuel hydrogen-powered vehicles.



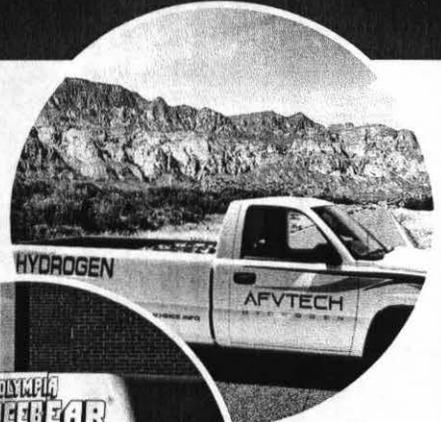
Hydrogen Utilization

Putting clean hydrogen to work for transportation, electrical generation, and heating/cooling applications . . .

When hydrogen is utilized in a fuel cell, it produces electricity, heat, and water with no harmful emissions. Hydrogen can also be used in modified internal combustion engines (ICEs) with significantly reduced emissions. Although wide utilization of hydrogen is still in the future, there are many uses of hydrogen that are practical today, such as off-road vehicles (forklifts, ice refinishers, commercial all-terrain vehicles), backup generators, and more. The state of North Dakota has numerous hydrogen utilization technologies in development and demonstration including the following.

- **Internal Combustion Engines**

With some modifications and a certified hydrogen fuel tank, today's vehicles can be converted to use hydrogen. Basin Electric Power Cooperative and the EERC, as part of the Wind-to-Hydrogen project, have partnered with AFVTECH to convert the standard gasoline engine in three Chevrolet Silverado 4x4 half-ton pickups to operate on hydrogen, gasoline, or E85, making them trifuel vehicles.



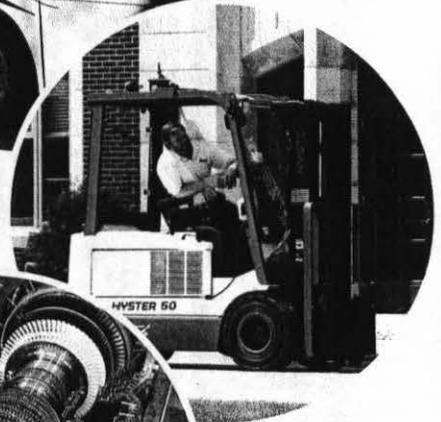
- **Fuel Cell Ice Refinishers**

The NCHT, along with key partners including ePower Synergies, Inc., and Olympia, has developed the first commercially available fuel cell-powered ice resurfer called the **eP-Ice Bear**, which is available for use on ice rinks worldwide today. The fuel cell exhaust contains only water vapor. All harmful gases are eliminated.



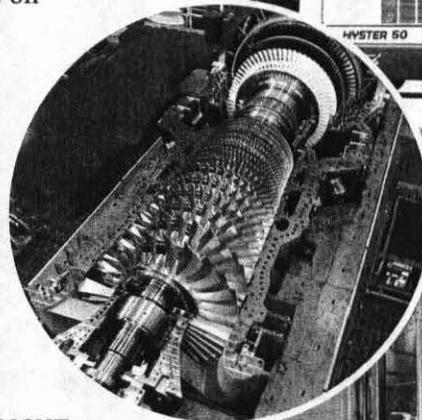
- **The Hyster Fuel Cell-Powered Forklift**

A 4000-pound-capacity lift truck system is currently being tested by the North Dakota Army National Guard. The NCHT has partnered with the U.S. Army Engineer Research and Development Center; ePower Synergies, Inc.; and the U.S. Air Force to develop a dependable hydrogen-powered fuel cell system that replaces the batteries on a conventional electric forklift or standard engine in typical propane- or diesel-powered forklifts.



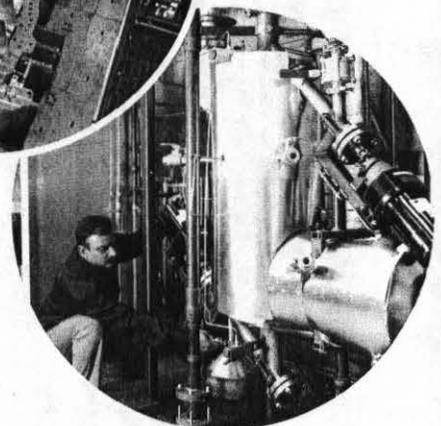
- **Hydrogen Turbines to Produce Electricity**

The NCHT is involved in enhancing engine, turbine, and fuel cell development to efficiently use hydrogen. The NCHT is teaming with Siemens Power Generation to help develop the next generation of turbines, which will use hydrogen fuel and advanced combustion systems to reduce emissions while producing electricity.



- **Advanced Fuel Cell Energy Systems**

To work well, fuel cells need high-purity hydrogen fuel. The NCHT is developing new systems that will produce high-purity hydrogen for use in solid oxide fuel cells. One new system produces hydrogen-rich gas from biomass, which can go directly to a fuel cell with no need for gas cleaning.



“When you look at the future of energy in this country, one of the most promising technologies on the horizon is hydrogen.”

– U.S. Senator Byron Dorgan

Hydrogen . . . *Did you know?*

Hydrogen is the most abundant element on Earth . . . Hydrogen (H_2) is combined with oxygen (O) to make water (H_2O). Hydrogen also exists with carbon (C) in plants and fossil fuels like coal, oil, and natural gas. Hydrogen is obtained by processing these plentiful hydrogen sources and separating the hydrogen.

In 1959, Allis-Chalmers created one of the first fuel cell vehicles . . . a farm tractor. With 15,000 watts of power, the tractor generated enough power to pull a weight of about 3000 pounds.

The EERC, located in Grand Forks, North Dakota, was designated the National Center for Hydrogen Technology (NCHT) in 2004 . . . The EERC received that designation from the U.S. Department of Energy in recognition of over 50 years of expertise in hydrogen and gasification technologies.

Hydrogen is a safe fuel . . . When hydrogen escapes from a vessel, it rapidly floats upward, thus eliminating the safety risk of the fuel igniting and fire engulfing the vehicle.

Hydrogen is a clean fuel . . . When hydrogen is used in a fuel cell, only heat, water vapor, and electricity are produced, greatly reducing air pollution. When hydrogen is burned with air in a conventional internal combustion engine, only water vapor, nitrogen compounds, and heat are emitted.

How does a fuel cell work? A fuel cell operates like a "rechargeable" battery. However, it does not run down or require charging. It uses hydrogen and oxygen in an electrochemical process that generates continuous electricity and heat.

North Dakota is a leading energy producer in the United States . . . Per capita, North Dakota is the fifth largest producer of energy and has the largest wind resource available (commonly referred to as the Saudi Arabia of wind).

“Hydrogen technology is now, not tomorrow. Specialty vehicle applications are just the first wave—the EERC and its corporate partners are involved in the development of a variety of specialty hydrogen fuel cell vehicles, which are providing a cornerstone for deployment of hydrogen fuel cell-powered highway vehicles.”

– EERC Director Gerald Groenewold

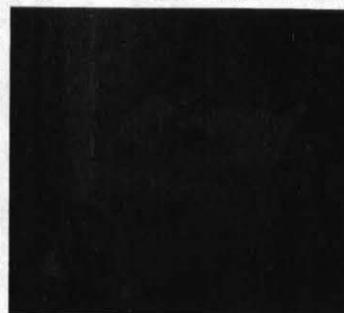
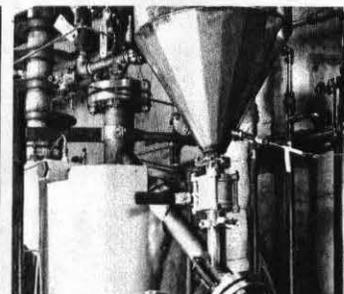
“The EERC is a model for our Centers of Excellence concept, illustrating a successful partnership between business and research that results in high-paying jobs and career opportunities for our citizens. The new hydrogen technology Center of Excellence facility will generate those jobs and career opportunities by developing the products of the future.”

– The Honorable John Hoeven, North Dakota Governor

For more information contact:
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Grand Forks, ND 58202-9018
(701) 777-5000
www.undeerc.org

HYDROGEN

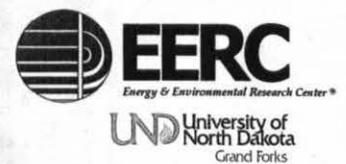
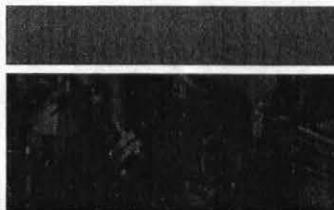
Fueling Our Future . . . **NOW!**



National Center for Hydrogen Technology
Focused on the World's Future Energy Needs



EERC Technology. . . *Putting Research into Practice*



A Unique Challenge . . . Integrating Hydrogen into Our Everyday Lives

Hydrogen is envisioned to be the primary fuel of the future, strengthening the energy security of the United States. Hydrogen as fuel in a fuel cell, turbine, or combustion engine produces no harmful emissions, only water. However, we need to develop the technologies and infrastructure to support a hydrogen economy. Significant advances are being made throughout the world to develop technologies for hydrogen production and delivery. The Energy & Environmental Research Center (EERC) is on the leading edge of this research. The challenge in the hydrogen economy is to develop individual components, test various technologies, and put them to work from production through commercial deployment.

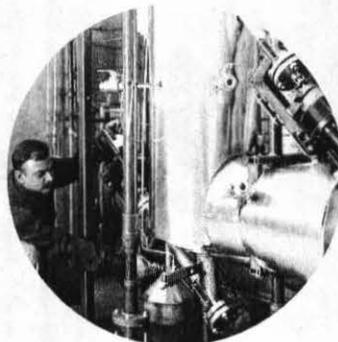
Meeting the Challenge

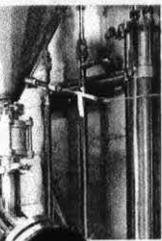
New fuels need to be reliable and deliver substantial economic and environmental benefits. A successful hydrogen economy requires that we apply optimal designs and applications for a variety of uses. The National Center for Hydrogen Technology (NCHT) at the University of North Dakota (UND) EERC in Grand Forks, North Dakota, has the experience, expertise, and facilities to take a lead role in developing, in concert with its industry and government partners, all aspects of the hydrogen economy.



The EERC, ePower Synergies, and the U.S. Army and Air Force are working to couple a fuel cell vehicle with the EERC's on-demand hydrogen-dispensing technology for potential military uses.

The EERC's biomass gasifier produces hydrogen-rich gas for use in a solid oxide fuel cell system.





Providing Real-World Solutions Today

The EERC's NCHT is integrating technologies for the production and use of hydrogen as a practical fuel. The EERC is leading the way to produce hydrogen from fossil and renewable fuels, to develop the hydrogen gas station of the future, and to utilize hydrogen in combustion engines and turbines and in fuel cells.

Current Activities

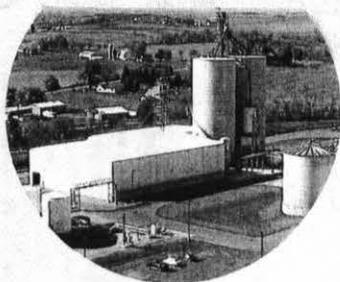
The EERC has more than 50 years of experience with hydrogen production and fuel cell technologies—integrating innovative concepts to develop, demonstrate, and commercialize technologies that impact the way we live. The EERC, with its other nine strategic centers of excellence, is leading the world in energy and environmental research and development that are integral to the NCHT; its activities include:

- Integrating technologies that will allow us to safely and efficiently refuel our vehicles with hydrogen.
- Addressing the challenges of putting hydrogen fuel cells to work as part of everyday life.
- Developing, demonstrating, or commercializing technologies that produce hydrogen from fossil fuels, including coal, natural gas, and petroleum.
- Making hydrogen from many renewable sources such as crops, trees, wind energy, and agricultural by-products.
- Producing the cleanest hydrogen gas possible to minimize impacts on fuel cells.

Capabilities

The EERC operates comprehensive world-class technology demonstration facilities and laboratories, including expertise in the following areas:

- Producing hydrogen from a variety of fuels with a variety of technologies
- Testing fuel cells in conjunction with hydrogen production systems
- Developing and fostering industry and government partnerships to test technologies in real-world situations



A new technology being developed at the EERC could expand the use of ethanol with a process that produces pure, clean hydrogen from ethanol plants.



The EERC, DOE, and Basin Electric Power Cooperative are demonstrating hydrogen production from wind power for use in vehicles and farm equipment.



About the EERC

The EERC is a research, development, demonstration, and commercialization facility recognized as one of the world's leading developers of cleaner, more efficient energy technologies as well as environmental technologies to protect and clean our air, water, and soil. The EERC is a high-tech, nonprofit branch of UND which operates like a business. The EERC employs more than 280 people from more than 90 different disciplines, including numerous specialized fields, and is aggressively expanding its staff. The EERC currently houses 216,000 square feet of offices, technology demonstration facilities, laboratories, and some of the world's most advanced equipment and instrumentation.

The Center was founded in 1951 as the Robertson Lignite Research Laboratory, a federal facility under the U.S. Bureau of Mines. It became a Federal Energy Technology Center under the U.S. Department of Energy (DOE) in 1977 and was defederalized in 1983. At that point, it became a part of UND, with the stipulation that it would not receive state-appropriated dollars. Today, the EERC leverages and enhances government research dollars by developing partnerships with industry, government, and the research community. Since 1987, the EERC has had more than 875 clients in all 50 states and 47 countries.

The EERC's ten Centers of Excellence include the Coal Utilization Technologies Center, the Emission Control Technologies Center, the National Center for Hydrogen Technology, the Center for Climate Change and CO₂ Sequestration, the Center for Air Toxic Metals® (CATM®), the Center for Renewable Energy, the Water Management Center, the National Alternative Fuels Laboratory® (NAFL®), the Supercritical and Subcritical Extraction Technologies Center, and the Coal Ash Research Center.



For more information contact:

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National Center for Hydrogen Technology
Focused on the World's Future Energy Needs

Testimony on HB 1458

Rep. David Monson, District 10

This bill is very similar to one that I introduced last session. The bill works on the premise that the most perfect fuel in the solar system is Hydrogen. Hydrogen can be burned in internal combustion engines or used in fuel cells in vehicles. It can be used to produce electricity, used to make fertilizer, and its potential is unlimited, maybe someday even used in nuclear fusion reactors simulating our sun. It can be made from wind generated electricity conducted through water, made from lignite or natural gas, and by other more complicated methods. The end product of burning Hydrogen is pure water. In fusion the end product is Helium. No pollution or hazardous waste at all.

Much research has been conducted in recent years using Hydrogen. Much of it has been done right here in ND at the EERC in Grand Forks. It is now time to move this research to the next level. It is time to go beyond research and put this valuable fuel into vehicles. It is time to put the research to real use in the real world. There are vehicles, both federal and state owned, as well as industry owned right here in ND. Their use is definitely limited due to a lack of fueling stations.

This bill comes to the rescue. This bill will provide ND's share of funds needed to leverage other funds and partner with other states, the federal government, and private industry to actually get a working Hydrogen fueling station in Fargo.

Why Fargo? It is on the crossroad of the Hydrogen highway from Winnipeg to South Dakota and beyond (I-29) and Fargo to Minneapolis and beyond (I-94). ND is ready to move to this level and Fargo is the logical place in ND due to its location. They are ready to go with this project.

This bill does more than just bring a Hydrogen fueling station to Fargo. It also makes reference to a "Hydrogen Roadmap" and Hydrogen goals. The language is purposely broad and a little vague to allow for future definition. This roadmap is a dynamic and changing document as more research and technology evolve. It is ND's small piece in a larger and growing national Hydrogen policy. It shows that ND is ready to become a player in the game.

If you have questions I'd be happy to try to answer them, although there are many others here to testify on the bill who know much more than I do about the bill and the project.

HB 1458: Establishment of State Hydrogen Goal, Development of State Hydrogen Roadmap and Support for a Fargo-Moorhead Hydrogen Production System

**Testimony to the Senate Natural Resources Committee
March 8, 2007**

**Brad Crabtree
Great Plains Institute
Ashley, ND
(701) 647-2041
bcrabtree@gpisd.net**

Thank you Chairman Lyson and committee members for the opportunity to testify on behalf of HB 1458. I also want to thank Representative Monson and the other bill sponsors for their recognition of North Dakota's potential in the hydrogen economy of the future.

My name is Brad Crabtree. I am program director of the Great Plains Institute, a nonprofit organization based in Minnesota and North Dakota. The Great Plains Institute staffs the Upper Midwest Hydrogen Initiative (UMHI), a public-private consortium whose membership ranges from Fortune 500 firms such as 3M and Xcel Energy to smaller technology companies to major research institutions from five Upper Midwest states and Manitoba. By advancing public policy, demonstration projects and education, UMHI works to accelerate the transition to a hydrogen economy and to maximize North Dakota's and the region's comparative advantage in hydrogen production from renewable energy sources and from the gasification of coal, petroleum coke and other fossil energy feedstocks.

Through the Great Plains Institute, UMHI members have developed and presented an annual menu of hydrogen policy recommendations to the Legislators' Forum, a bi-partisan coalition of legislators from the Dakotas, Minnesota and Manitoba. Representative Monson and Senator Heitkamp both serve as North Dakota delegates to the Legislators Forum. Drawing on these regional recommendations last legislative session, Representative Monson, Senator Tollefson and others sponsored HB 1496, which was passed and established a sales and use tax exemption for qualified hydrogen projects. An appropriation was also sought, unsuccessfully, to provide state cost share for a Fargo-Moorhead hydrogen fueling station.

HB 1458 seeks to build on legislative efforts last session and to take further steps consistent with recommendations broadly supported by industry and the research community throughout the region.

Section 1 of this bill establishes a statutory hydrogen development goal for the state. While this may seem like a modest step, Minnesota established such a goal last session, and it has proved useful in focusing public and private efforts in hydrogen policy and projects.

Section 2 tasks the Department of Commerce to oversee development and implementation of a state hydrogen roadmap for achieving the statutory goal over time. The bill language provides clear direction regarding desired components of the roadmap, and similar roadmaps already prepared by the U.S. Department of Energy and several U.S. states can provide further guidance. The language also directs the Department to seek broad input from industry, agricultural interests, research institutions, nonprofit organizations and any other interested parties who wish to contribute. In this legislative session, there has been frequent reference to the need and desire for a comprehensive approach to energy policy in our state. Section 2 provides a vehicle for

development of just such a comprehensive approach in the realm of hydrogen. Fortunately, hydrogen lends itself, indeed requires, an integrated approach to energy policy and projects since commercial technologies exist to produce hydrogen from all of North Dakota's energy sources.

Section 3 authorizes an appropriation of up to \$200,000 to provide state cost share to be combined with Minnesota state cost share, federal funding and private investment for a hydrogen production system in Fargo to serve Fargo, West Fargo and Moorhead. Members of UMHI have consistently stressed that one of the most important roles government can play at this time is support for visible demonstration projects to commercialize hydrogen production technologies for use with fleet vehicles and other equipment. While the technology is available, we are still early on the path toward commercialization, and such projects are not yet viable in the marketplace without public support.

The attached map shows that our region is largely being left behind in the development of hydrogen fueling stations, despite our potential to be North America's low-cost producer of hydrogen fuel. Fortunately, North Dakota has taken an important step with a wind-hydrogen project under development in Minot that involves a number of institutional partners. We now need to proceed with another hydrogen demonstration project in our state's largest metropolitan area, ideally located in close proximity to the junction of I-94 and I-29 in order to serve as an important hydrogen fueling point in a larger network of stations envisioned for our region's Interstate corridors. We have dubbed this network the "Northern H" with fueling stations proposed from Winnipeg to Sioux Falls in the west, Duluth to Des Moines in the east, and Fargo to Madison from west to east.

The cities of Fargo and Moorhead, the Fargo-Moorhead Chamber of Commerce, NDSU, Cass County Electric and Moorhead Public Service support this project, and more partners will be involved at the project design stage. The state of Minnesota is stepping up to the plate as well. Last session, \$600,000 was allocated for hydrogen stations, with Fargo-Moorhead being an intended location. However, technical problems with the wording prevented those funds from being utilized. Now, major bipartisan hydrogen legislation has been introduced that will not only fix the legislative language, but also request a major additional \$10 million state investment in hydrogen projects and roadmap development. This legislation passed the Minnesota Senate Energy, Utilities, Technology and Communications Committee unanimously yesterday.

It is my hope that you will build on the momentum this session to invest in North Dakota's energy future by adding the hydrogen commitments in this bill to the broader energy agenda. I respectfully request a do-pass recommendation on HB 1458.

Senate Natural Resources Committee
Stan Lyson, Chair
March 8, 2007
HB 1458

Mr. Chairman and Members of the Committee: My name is Gerald Groenewold, and I am the Director of the Energy & Environmental Research Center (EERC) at the University of North Dakota. I am writing to oppose HB 1458.

In 2004, the EERC was designated by the U.S. Department of Energy as the National Center for Hydrogen Technology (NCHT). That designation was earned as a result of nearly 60 years of hydrogen-related research and commercialization activities, including hydrogen production, dispensing systems, and utilization technologies (see attached brochures).

We are particularly pleased that the State of North Dakota recognized the EERC's National Center for Hydrogen Technology as one of the state's Centers of Excellence and, in 2006, provided \$2,500,000 to assist in construction of a new facility for our constantly growing hydrogen programs. Those state funds have been leveraged with \$500,000 from the City of Grand Forks, and the facility is nearing completion.

The EERC's global reputation in hydrogen research and technology commercialization has resulted in an ever-increasing number of contract awards in the past 3 years. Those awards total over \$30,000,000, with another \$14,000,000 pending (see attached list). EERC hydrogen programs currently in place involve partnerships with the energy industry, manufacturers, technology companies, farm organizations and commodity groups, the State of North Dakota, the U.S. military, key federal research agencies, universities, and nonprofit organizations.

The EERC's hydrogen programs are all practical, market-driven activities, which are providing North Dakota with the unique capability to develop an extremely sophisticated, ever-evolving road map for our state.

I find it interesting that the bill recommends one of the deliverables be a "final road map by July 1, 2008." Any road map delivered on a specific date will certainly be outdated within a few months because of the constant stream of major technological breakthroughs associated with hydrogen and fuel cell technology, many of them coming from the EERC.

Another goal of the proposed legislation is to appropriate funds to North Dakota State University for the purpose of "developing and deploying, in partnership with industry and the City of Fargo, a commercially promising hydrogen production system combined with

a specific end use or uses" for the next biennium. The EERC's NCHT is currently involved in several programs which are accomplishing that objective, in partnership with industry, using a wide variety of feedstocks and a wide variety of final use applications.

Another focus of the EERC's program is the development of new, innovative hydrogen dispensing systems. One of our long-term partners is Kraus Global, based in Winnipeg, Manitoba, which is one of the world's leading developers and vendors of alternative fueling systems. Air Products is another key EERC partner. Air Products is the largest commercial producer and distributor of hydrogen in the United States and the leading producer of both mobile and stationary hydrogen fueling stations in the United States.

The EERC is also the technical lead for the wind-to-hydrogen fueling system being developed in Minot in conjunction with Basin Electric Power Cooperative. The EERC has designed and built a mobile fueling system for the Grand Forks Army National Guard facility, and we are currently designing a new hydrogen fueling system for the Grand Forks Air Force Base.

The EERC has already been very successful working with several leading hydrogen fuel cell manufacturers in developing, demonstrating and, now, commercializing hydrogen fuel cell-powered off-road vehicles, such as forklifts and ice refinishers. The EERC is currently in negotiations with General Motors to become the national test site for GM's hydrogen fuel cell vehicles.

The requested legislation is an unnecessary duplication of an existing program and, even if funded at the level requested, would be a very pale imitation of an existing robust program.

I strongly request a no vote on HB 1458.

**Curtis Jabs - Basin Electric Power Cooperative
North Dakota House Bill No. 1458
Senate Natural Resources
March 8, 2007**

Mr. Chairman and members of the committee, my name is Curtis Jabs and I am here representing Basin Electric Power Cooperative. Basin Electric supports hydrogen research in North Dakota. Hydrogen is uniquely suited for transportation use. Hydrogen can be created by a variety of resources and its clean-burning properties make it desirable as an alternative, renewable fuel.

Basin Electric has taken a lead in the state in research and development of hydrogen as a transportation fuel. In partnership with our members, U.S. Department of Energy, North Dakota State University (NDSU) North Central Research Extension Center and others, Basin Electric is constructing a project to convert wind power into hydrogen at the NDSU North Central Research Extension Center. The project will use renewable electricity produced by Basin's Minot Wind Project to run an electrolyzer to convert water into hydrogen and oxygen. The hydrogen will be stored on site for use as a transportation fuel and for operations at the NDSU North Central Research Center. Three 2006 GM Flexfuel pickups are already converted to run on hydrogen for Verendrye Electric Cooperative, Central Electric Power Cooperative, and the NDSU North Central Research Center. NDSU is also working on converting tractor to run on hydrogen for use at the Experiment Station.

HB 1458 would give the state a goal and the ability to define how other hydrogen projects could be developed across the state. The vision to replace our oil imports through renewable fuels like hydrogen to power our transportation infrastructure is a worthy goal.

This concludes my testimony and I would be open for questions.