Testimony of
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Before the Subcommittee on Energy,
Natural Resources and Infrastructure
Committee on Finance
U.S. Senate

May 24, 2007

Mr. Chairman and Members of the Committee thank you for inviting me to testify before you today on the subject of improved energy efficiency in refrigeration and cold storage. Although NanoPore is developing a range of energy savings technology for concepts such as air conditioning using waste heat for automotive and housing, the topic that we are very passionate about is energy production via the application of advanced thermal superinsulation.

We strongly believe that the lowest cost form of new generation capacity comes from increasing the efficiency of existing products. In particular, retrofitting insulation to applications originally designed in the era of low cost energy and ignoring the environmental impact of energy use. Although not as sexy as new ways to produce energy, retrofitting older, energy intensive applications has the potential for demonstrating similar energy savings in a much shorter time period and at greater economic and environmental savings to society.

The history of thermal insulation has followed a 30-40 year technology cycle. In the 60's, we saw the widespread adoption of polymer foams such as polyurethane and expanded polystyrene. These materials, produced from petroleum, offered a 30 to 50% improvement in thermal performance as compared to fiberglass. However, they were historically produced with blowing agents with ozone-depletion potential that leached out over time leading to lower thermal performance and the release of the blowing agent to the atmosphere. With the Montreal Protocol, blowing agents were replaced resulting in lower thermal performance and performance still degrades with time as volatile organic compounds are released to the atmosphere. Before foams, fiberglass was (and for many applications, still is), the thermal insulation of choice. Before fiberglass, there was asbestos, cork, dried seaweed, and wadded newspaper. Of course, the problems with asbestos are now well-known but its legacy has been a thermal insulation industry in this country which has seen very limited innovation in the last two decades.

The main advances in thermal insulation occurred in the late 80's as General Electric and Whirlpool demonstrated the commercial use of silica vacuum insulation panels in domestic refrigerators. These panels offered thermal performance approximately four times better than foams and were used in many refrigerators as part of a DOE-sponsored rebate program. Since the early 90's, NanoPore has doubled the thermal performance of this type of superinsulation and with improvements in vacuum packaging technology, we are now selling our superinsulation to a wide range of customers from packaging for shipping drugs to hiking boots. However, rarely is our customer using superinsulation for energy savings but rather for some other benefit, ranging from reduced shipping cost to personal comfort.

So if we produce thermal superinsulation that is at least seven times better than foams and twelve times better than fiberglass, why are customers not using it to save energy? The main reasons include:

1) Just as with solar and wind energy, the production of advanced insulation is in its infancy and the cost of our insulation has only begun to decrease significantly;
2) Advanced thermal insulation adds to the capital cost of an item that must be depreciated over time whereas higher energy costs can be immediately deducted (i.e., our own tax code argues against the use of insulation);
3) Society is not aware of energy efficiency to nearly the same level as they are of renewable energy, and;
4) Most customers paying for the insulation are not reaping the economic benefits of energy savings.

Residential construction provides a good example of the current forces that work to discourage maximum efficiency. If it was not for building codes, most houses would have minimal thermal insulation. The builder and consumer want to keep the house price low, the energy consumption of the house is low on a consumer's list when purchasing because we are not used to thinking about energy, and we don't have a good comparison of energy expenses while shopping for houses. How many houses have a yellow tag showing the annual utility bill like a refrigerator now does?

I suppose that some would say that market forces should govern the use of better thermal insulation and, if the return on investment is adequate, the market will drive the implementation of new technology. My favorite response to this statement is to direct our attention to the hot water heaters we have in our homes. How many of us have gone to Home Depot or Lowe's to buy a insulation blanket for your hot water heater? If our heater is electric, the investment pays for itself in months, not years.

There are a number of large applications where the use of superinsulation can yield dramatic energy savings, namely refrigerated trucking, cold storage, vending machines, and home refrigeration.

- Refrigerated trucking is a perfect example of an area in which a small investment in technology can yield great savings. There are over 200,000 reefer trailers on US highways that use, on average, over 2,000 gallons of diesel per year just for the cooling unit. The addition of thin superinsulation to either retrofit the 200,000 existing trailers or in the 40,000 new trailers built every year would save approximately 1,000 gallons of diesel per year per trailer. The trailer operator would have to invest $7,000 to $10,000 in capital which must be depreciated over a number of years to save the 1,000 gallons of diesel per year.

The only risk to the operator is that diesel prices decrease, yet this is ***the*** barrier to the large capital investment of better insulation today -- not the higher operating cost of using more diesel fuel. Of course, the operator also sees no economic benefit to the reduced emissions from the potential reduction of burning over a hundred million gallons of diesel per year.

- Cold storage is another area ripe for investment. In the United States, there is approximately six billion cubic feet of cold storage space which ranges from small walk-in cooler and freezers in local restaurants to very large facilities that support the import and export of fresh and frozen food. Energy costs are typically the number two operating cost at these facilities and many were built decades ago during the years of low energy cost. Retrofitting the cold storage industry with only a ¼" thick layer of superinsulation could save almost 2,000 MW of generation capacity (several very large generation plants).

- Beverage vending machines are a perfect example of how there is often disconnect between the person who pays for the insulation and the person who pays the energy bill. Most vending machines are owned by large beverage/ice cream companies and loaned to the location where the machine is placed. The store/office/university must pay the energy cost. There are approximately 2 million vending machines in this country and the retrofit application of a ¼" thick superinsulation would save over 500 MW of energy. This energy savings does not account for the knock-on effect that when energy is being expended inside a building, there is an additional energy load on the HVAC system. Although reducing the energy consumption of new vending machines is an important step, retrofitting older machines with lower efficiency will bring even greater benefit in reduced energy consumption and its associated environmental impact. However, for the vending machine operator, the payback time for better insulation may be longer than the remaining service life of an older vending machine.

- Household refrigeration can also be made much more energy efficient at relatively low cost. In the United States, there are over eight million domestic refrigerators produced every year. Although the efficiency of domestic refrigerators has improved dramatically as a result of energy policy over the last 20 years, the selective use of superinsulation in fridges could lead to another 20-30% improvement in energy performance. As a result of the large number of fridges, the energy savings are dramatic. As with vending machines, the energy efficiency of a refrigerator goes beyond the fridge itself because it affects the house HVAC energy consumption.

The insulation technology we have developed at NanoPore offers benefits beyond the first tier energy savings. It also represents an improvement in manufacturing technology.

The production of conventional thermal insulation is energy intensive, often produced from petroleum, and causes recycling/disposal problems. In comparison, superinsulation is produced primarily from silica and is completely recyclable. In addition, and perhaps just as importantly, both the superinsulation and silica raw material are produced in the United States.

As with any new and growing industry, the expansion of production and supplier capacity depends upon market certainty. Energy costs are not predictable and although most of us think that energy prices will continue to rise, many of us are not willing to bet large amounts of capital that energy prices will stay at current levels for the foreseeable future. In the same way that government policies around the world have served to jumpstart the solar and wind energy generation industries, the growth of the superinsulation industry and its suppliers will be enhanced by some means of government encouragement. Unlike many energy savings programs where strict metrics may be used for incentives, superinsulation can be used in a wide range of applications so we believe that the best way to encourage its use is via an investment tax credit to the customer.

I would like to thank you for the invitation to speak today and I hope that the information provided will be useful.