HiPerBRIC BrownBag
Notes
5 March 08

What is the market-average payback? Three to four years is typical in the market now. Very few companies accept payback longer than five years.
But some building retrofits have >10 year payback periods.

> One definition of payback: what ESCOs are willing to live with.
> Payback time is a commonly used one, but we will need to use other metrics as well, for example, to evaluate retrofits with different lifetimes.
> Another possibility: internal rate of return (IRR), for example, an IRR better than 10%.

To motivate a rapid transition to energy efficiency, what is relevant is what people will pay.

Will this effort be entirely market-driven? Or will markets be willing to accept input and guidance from the government? E.g., the WPA was formed as a policy tool to solve a problem.

The HiPerBRIC timeline is flexible. CPUC goals are flexible, especially the long-term ones, e.g., those labeled as 2030 goals.

> Concerned about the broad range of 2030 goals. What matters is total greenhouse gas emissions over time.
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> Early reductions in GHG have a much more valuable effect than later ones (the integral of emissions under the curve is what counts, not the emissions or reductions by 2030).
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> What is the 2030 endgame – capabilities to achieve the goals or actual results?
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>> The purpose of this discussion is to identify the lowest hanging fruit, but also, to not miss the opportunity to develop applications that have long term value.
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> What's needed are extremely deep cuts in GHG now. Need much more effort on existing buildings. The projects that you choose will depend on where you want to be in 2030. We need to start retrofitting hundreds of thousands of buildings now.

Outcomes on the current HiPerBRIC milestone map are not etched in stone.

Are there energy/ft^2 building codes? Not—currently, prescriptive codes.

It is difficult to enforce a standard for how buildings actually perform. There are huge liabilities for buildings that don't meet the standard, and lots of industry opposition.

Monitoring scheme for buildings is important. If you can monitor building energy use accurately in real-time, it is easier to meet a building performance standard.

Energy performance schemes are moving forward at a state level. We have contacts and influence in this area.

If you achieve market goals, why do you need codes and standards?

What kind of buildings do we actually want to occupy? This needs to be thought through. What do people actually like? What is cool?

Real-time information available in the Prius—analogy to buildings. Real-time information for building operators could improve building energy performance.

How much of this can be accomplished purely through technology research that does not require assumptions about how people will respond in the marketplace?

We need to develop the killer app! Need to make energy efficiency cool.

We have to start at the other end of the problem, with behavior, and what energy service people need.

There is 30 years of empirical evidence that buildings don't work. Buildings are broken. We need to go into buildings, figure out what's broken, and provide a national incentive program to figure out what's needed.

> Example— a Canadian program that does a home energy audit of your home, provides you with a work plan to make it more efficient, and provides matching funds to get the work done.

Discussion about whether the outlined plan for HiPerBRIC will work in existing buildings; different approach needed for retrofitting existing buildings vs. building new ones.

The more complicated you make it, the more things there are to break.

Training—need an approach to training the people who will operate buildings.

Plug and play technologies—so that building operators and technicians don't have to know everything about the technology in order to work on it. Don't have to tinker extensively to get better results. Make buildings idiot-proof or at least idiot-resistant.

Differences and similarities between buildings and cars: Cars are manufactured as units, many are built identically, and the fleet turns over more quickly than buildings.

For retrofits, the major project themes of HiPerBRIC don't work.

Training component must prove to building operators that the technology we will develop will work, will produce results.

> Training needed for all the trades and building inspectors.
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> We need smarter people and smarter systems.
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> The education and training activity could be a significant element of this plan.
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> Perhaps education and training should sit outside of HiPerBRIC; we should partner with others to provide this. The external interface to HiPerBRIC can disperse knowledge and train the technology's users.

Cars are manufactured. They are easier to develop plug and play technologies for. A different balance will be required for buildings, between the knowledge in human beings, and intelligence built into automated systems.

We should look at the example of wireless home security systems. They are always looking at a building's weak spots. What are the critical areas of the building that need to be managed?

> This is a perfect model for reaching small commercial buildings, which are not that different from homes.

Imagine the analogy of a computer, with hardware and software.

> The building integration platform is equivalent to computer software. Building system integration can get you to 75%. Changes in hardware can reduce energy use 25%. In a building the hardware is equipment. Hardware can be used to reduce the energy use of the building. How much energy efficiency can be gained simply by making changes in software? Can improvements in the home software get you the 25 to 75 % energy use reduction? Can you use the success of the software to justify acquiring the hardware you need to gain the first 25% reduction?

Through 2030, there will not be enough new building to get the large GHG reductions needed. This suggests that retrofit focus is important.

We need to determine where HiPerBRIC can have the biggest impact. Need to retrofit very large numbers of buildings.

The pipeline from research to implementation is broken—need to fix it.

What should be our focus? How should we relate to the utilities and their e.g., emerging technologies programs?

> [*Much disagreement over the degree to which other institutions such as utilities and government recognize this problem, to what extent they are trying to fix it.*] Utilities recognize that there is a problem.

Getting technologies into the market, overcoming the Valley of Death, will be the measure of success of this effort. Hiper BRIC needs a model that will succeed in the marketplace. This not a problem in research—it's a problem of markets, business, policy.

We need to take development risks.

[*Much discussion on development and deployment.*] In other areas, such as medical technology, more than 50% of the work is getting the research and technology into the community, e.g. getting people to change their lifestyle for better health.

The real analogy for buildings and HiPerBRIC is not the moon shot, it's polio—developing delivery models.

> But health is a personal motivator….there is no motivation now for energy efficiency, and no market for it. Unsuccessful in giving people a reason to buy energy efficiency.

The future will be like the past, because in the past, the future was like the past.

There is immense frustration, because we have come up with a lot of ideas that have not gone where they should go. Nonetheless, there is a real opportunity here, because utilities have recognized they must address the problem, and are working to solve it, as have building operators and local/state levels of government. The times and the politics are changing.

There is a trade off: We could retrofit 250,000 buildings in the near term within five years, and we'll get 25% energy savings. But then those buildings won't undergo another round of retrofits for years. Instead, it might be better do a retrofit of these buildings in five to ten years when we can get 50% savings—will get a much larger level of savings from a large-scale retrofit by starting farther down the road when the technology is better. (Opportunity cost v. loss of carbon savings.)

It is not just technology, but when and how to deploy it.

The CPUC met this challenge in their plans by phasing in changes. First, require labeling in energy bills so building managers know what is using how much energy. Then introduce stricter codes, action-oriented benchmarking. This approach is not technological—it is a marketing approach. Also, a technological approach on a second track.

We need to think about monitoring and diagnostics at the system level.

What are our core competencies? Where can we make our biggest contribution?

What are the gaps that need to be filled?

We are trying to figure out how to build a consortium that other partners can join later. There may be several consortia.

What is the United Technologies role in overcoming the Valley of Death?

> United Technologies wants to send researchers out here. They want to be involved in pre-competitive research with other industrial partners, including competitors.

Need to build a venture capital link, figure out how to get them to invest in energy efficiency. How can they increase their investment 10 times in 5 years?

Post research vs. pre-research. Can we design this program so that the technological results will be easier to manufacture from the start?

Where does manufacturing engineering fit? Need to address. Have had some discussions with China.

How can business make money from HiPerBRIC? How to monetize? What's the business model for e.g., monitoring and diagnostics?

Questions to ask are: who is going to sell it? How to scale it up, how is it going to be sold? What is the value proposition to the customer? What is the value chain? Who are the key people who will make things happen?

To get policies and standards in place, you need to make a strong case for how much money people can save from adopting the technology.

What is your 'in'? What can we do? What is our niche?

How can we put it in succinct enough form that we have a really compelling case?

We need to set boundaries on what the Lab can do.

> Systems integration seems like a good organizing goal.

What is the proof of concept that will convince the people who will pay for it that they will get their 90% increase in efficiency?

> The proof of concept is the demonstration building that shows 90% savings.

A big challenge will be to find or develop a system that can be installed in the building that can be built on and improved upon later. Need both scalability and modularity.

> An open platform can facilitate this.

> Need security that whatever you invest in you can continue to build on later. This is the importance of having open systems, open architecture. "Linux of buildings"

What about systems and protocols that are already in use, such as BACnet, what is their status, can we build on this? — Can incorporate systems and standards that are already successful and working in the marketplace.

> We need to become knowledgeable about where people are already doing this, e.g. Echelon – communicating between appliances and power station.

Open systems has to be a theme of this work.

> Open architecture is the infrastructure to help the sales people sell their product.

Need an aggressive approach to new technology as well as implementation and policy.

Intention of HiPerBRIC is to engage all stakeholders in the industry, including competing companies.

SERC/JBEI efforts started as a series of meetings, followed by several workshops in which many researchers presented ideas. Eventually, a few leaders began to focus on topical areas, developed plans for each area, and created a proposal. Included "open mike sessions" in which anyone could offer ideas; very helpful in getting younger researchers to participate.

> Need to have workshops in different locations for a variety of potential participants (national labs, campuses, industrial partners)—at the Lab, on campus, as well as offsite.
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> Will try to have continuing meetings with this group. Plan to schedule a structured workshop in early April and another at end of April or early May.

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