A Perspective on Risk

H. Gil Peach, PhD

In the discussion of risk mitigation, we need to look at risk from both a financial and a physical perspective. And we need to protect the future.

Risk from a Utility Perspective

The major theme of the Duke Nicholas Institute study is that "[e]nergy efficiency investments have inherent risk benefits because they reduce exposure to uncertain costs, such as fossil fuel prices, can defer major generation investments, and reduce environmental emissions."[1] It has been demonstrated many times that energy efficiency can help energy customers become more independent of what would otherwise be systemic risks.

Ryan Bracken, Senior Economist in Strategic Planning at Northwest Natural Gas Company provided a useful example of how a major natural gas company creates a financial hedge against pricing risks. In his example, the risk of price fluctuation is hedged. However, the environmental emissions noted in the Nicholas Institute study are not addressed. The basic relationships for this solution are given as:

Hedge Value = (Long-term Fixed Financial Hedge Price – IRP gas price forecast) + Credit Facility Costs[2]

This covers the difference between the forecast and a locked-in hedge and is projected over, for the example, 20 years. Since this is purely an economic and financial solution, it assumes (1) that the forecast is sound (with an error band) and (2) that conditions over the 20 year length of the projection are stable enough that the hedging system will be able to operate consistently over that time horizon.

We have recently experienced two major economic incidents that occurred, in part, due to reliance on economic theory and financial tools, while the problems also had other dimensions. The first is the collapse of the energy deregulation era (sometimes called the restructuring era) and notably the damage done throughout California and Oregon associated with Enron's domination of markets. The more recent is the collapse of the system of housing derivatives (priced financially by reference to similar derivatives using a financial equation and using securitization). Both of these events caused a major and

---

[1] Hoppock, David & Dalia Patino Echeverri, *Using Energy Efficiency to Hedge Natural Gas Price Uncertainty*, Duke Nicholas Institute for Environmental Policy Solutions, January 2013 , Page 6. (http://nicholasinstitute.duke.edu/sites/default/files/publications/ni_wp_13-02.pdf)

[2] Presentation by Ryan Bracken to Oregon PUC Workshop, UM 1622.

in some ways crippling diversion of public capital to keep the respective energy and banking systems functional. So, based on these recent experiences it is prudent to qualify the purely financial approach by noting that it should work, everything else being equal, and that specifically it is assumed there will be no catastrophic event over the 20 year planning horizon. It is important to note that this particular solution operates within a ceteris paribus assumption and within a problem boundary which is purely financial. In other words, it is a "siloed" solution.

This solution addresses only one dimension of risk (it does not address the physical dimension) and if the model holds true for 20 years it may be suited to solve the financial problem at the utility level but not for the public and not for the customer.

Risk from a Public and Customer Perspective

Risk also has a physical dimension (linked with but separate from the financial dimension) and it can be reasonably asserted that the individual customer, and collectively the political public wants the physical dimension of risk covered in addition to the financial dimension. For a customer (industrial, commercial, residential, low-income), the problem is better cast as one of *survival* rather than of financial hedging. In a survival context (which might be expressed more moderately as maintaining a level of living), rather than a purely financial concept of hedging the relevant concept is "resilience".

The concept of resilience has long been used in physics and engineering where it refers to ability to return to normal conditions (or an approximation) following stress. The broader use of the concept of resilience in ecological systems was first introduced by the Canadian ecologist, C.S. Holling. Both engineering resilience and ecological resilience are relevant to energy efficiency planning and need to be given more emphasis in developing and selecting measures and programs.

Here is the essential difference in ability to address risk:

- The financial solution (creating a hedge) mitigates some amount of fluctuation in price under assumptions of ceteris paribus and no catastrophic event during the time horizon of the analysis.

- The physical solution (creating resilience) continues to work if conditions change and can be engineered to continue to function in some situations of catastrophe.

For example, a home with adequate insulation and a new gas furnace can endure a very harsh winter cold snap. But, the same home without the insulation and with an outdated and inefficient furnace will become uncomfortably cold even if a financial hedge works.

If we think about evolution in the natural world, the current understanding is that Darwinian random variation with selective retention works during stable periods but that periodically system changing catastrophes intervene and survival and selection during a time of catastrophe is largely a matter of geographic dispersal, size, and pure luck.[3] By analogy, the advantage to the public and to individual customers in curtailing risk is a combination of mitigation of financial risk and mitigation of physical risk. If times are stable, mitigation of financial risk may be enough. But if we are in a time of rapid change in which system conditions may be altered the mitigation of physical risk is critical. We need the home to be warm in winter and cool in summer and we need the gas appliances to continue to function.

So, some housing improvements like moving insulation levels to near net zero, adopting solar photovoltaics as a gas home improvement measure and replacing or supplementing residential gas water heaters with solar thermal water heaters have a physical risk mitigation value. In addition, while natural gas is an important bridge fuel away from coal and can play an important system role in balancing solar and wind, at the same time gas water heaters have been found to be responsible for more than a third of residential sector nitrous oxide emissions in California[4]. So, simply from a climate perspective this measure should be supported.

Probability of Ceteris Paribus

The problem of the 21st century is rapid climate change including both mitigation and adaptation. It is not simply that from South America through the Artic the climate is becoming warmer, or that there are serious water shortages throughout the America's and current drought emergencies in California and counties in southern Oregon, or that the snowpack is in the single digit percentages of normal. The current issue of the Royal Society's *Philosophical Transactions*[5] *B* is a special issue on Climate change and vector-borne diseases of humans. There are many diseases that find opportunistic advantage from both the warming and from damaged natural ecologies.[6] According to several authors we are in the Sixth Extinction event, this time human caused and the evidence of climate change surrounds us. So, the probability of "all other things being equal" is near zero. Also, the assumption of progressive improvement that underlies positive discount rates is not credible for this century. The economic formulas are not

---

[3] Leakey, Richard & Roger Lewin, The Sixth Extinction, Patterns of Life and the Future of Humankind. New York: Random House Anchor Books, 1996; original edition, Doubleday, 1995.

[4] ARB Almanac Emission Projection Data (2009): *2008 Estimated Annual Average Emissions Statewide.*

[5] 05 April 2015; volume 370, issue 1665.

[6] For a good summary, see "*Climate Change Does Have Some Winners, Like Brain-Eating Parasites".* by Joe Romm Posted on April 14, 2015 at 2:27 pm Updated: April 14, 2015 at 4:37 pm: http://thinkprogress.org/climate/2015/04/14/3646478/climate-change-winners/?utm_source=newsletter&utm_medium=email&utm_campaign=cptop3

wrong but the actual discount rate is highly negative going forward. The problem has been described by Joe Romm as “death by a thousand cuts” in which our ability to maintain our important systems declines as the century proceeds.

For these reasons, it is necessary to take DSM out of its silo and combine it with DR and Distributed Energy Resources (this means combining DSM and renewables) and use DER to address climate change. One implication is the necessary creative destruction of our current TRC test by providing – at the least – costing of carbon at its undiscounted damage value. This can be estimated at roughly 100 times its market value..

Summary

Risk has more than one dimension. Here, we look at price or financial risk and physical risk. A better approach than a financial hedge is physical improvement of buildings. If a hedge works, one is protected on the dimension of price. If improvement of buildings works, one is protected in the sense of physical survival and level of living. Both dimensions are important to the political public and to individual customers. An adequate cost treatment would involve moving from financial to physical (non-discounted) energy units (here therms) and addition of a factor to reflect actual cost of carbon damage. Also the problem of increasing dysfunction is immense and this implies a negative discount rate.

A climate perspective would require a focus not on maintaining the lowest cost measures but on funding deep measures offering deep savings and moving the building stock towards near net zero for the long term. The worst thing to do in the current climate emergency would be to cut back towards low-cost/no-cost measures. We need to transform the building stock so that homes can function semi-independently to the extent possible because as we move forward in this century it will become more and more difficult to keep systems consistently functional. Durability pays.[7]

We should be selecting for the deepest and most comprehensive measures with the longest measure lives.

H. Gil Peach
H. Gil Peach & Associates LLC
16232 NW Oakhills Drive
Beaverton, OR 97006
hgilpeach@scanamerica.net
www.peachandassociates.com
(503) 645-0716

[7] Bender, Tom, *Learning to Count What Really Counts*, Page. 19. Manzanita, OR: Fire River Press, 2002.