BPA E3T High-Performance Residential Buildings Technical Advisory Group (TAG) Scoring Results and Comments from TAG members

May/June 2014

Scores of five technologies (total possible score = 5)

SCORES	**Firmware Upgrade for DHP**	**Passive House**	**Reduce Appliance Standby Loads**	**3-Function Heat Pump**	**High-efficiency Set-top Boxes**
Energy Savings	3.4	4.1	3.0	3.8	3.2
Non-energy Benefits	3.3	3.3	2.1	2.8	2.4
Tech Readiness	3.4	2.0	3.2	2.6	3.0
Adoption Ease	3.9	2.4	3.1	2.8	2.3
Value	4.0	3.1	3.2	2.6	2.8
TOTAL	**3.6**	**3.0**	**2.9**	**2.9**	**2.7**

Ranking per criteria of five technologies

Ranking per criteria	**Firmware Upgrade for DHP**	**Passive House**	**Reduce Appliance Standby Loads**	**3-Function Heat Pump**	**High-efficiency Set-top Boxes**
Energy Savings	**3**	**1**	5	**2**	4
Non-energy Benefits	**1**	**1**	5	**3**	4
Tech Readiness	**1**	5	**2**	4	**3**
Adoption Ease	**1**	4	**2**	**3**	5
Value	**1**	**3**	**2**	5	4
TOTAL	**1**	**2**	**3**	**4**	**5**

High-efficiency Set-top Boxes

TOTAL AVG SCORE	2.7
Energy Savings	3.2
Non-energy benefits	2.4
Tech Readiness	3.0
Adoption Ease	2.3
Value	2.8

Energy Savings

- Savings estimates per unit for technology reasons are probably very good, but users don't have choice of equipment, and it's hard to estimate how many users can be influenced to choose efficient services
- There is very little leverage for achieving the savings potential in these devices, even if they currently utilized the kind of Aggios technology used in mobile devices. Service providers control what equipment end-users have and they have shown little interest in moving aggressively to adopt such technologies. Almost all of the energy savings will be found through whole system improvements and in an end-users choice of service provider and method for receiving electronic content.
- It looks like there is an effort to reduce the energy impact of the information systems by a factor of 5 while increasing the through-put by a factor of 10. Most of this energy seems to be associated with the infrastructure itself (cell towers, internet backbones, etc.). The bulk of this savings seems to be from technical advances in all aspects of this system (including the home). It is difficult to see how these components might go together and how the course of technology development (Moore's Law) might deliver this result without much intervention from the utility sector.
- Savings are assuming that the measure is defined and/or delivered as ongoing regional participation in an industry/national/international agreement and standard development to accelerate adoption of more energy efficient technologies, rather than early equipment retirement or other strictly regional intervention.
- Per unit the savings are pretty low from a consumer standpoint ($6 a year was the number in the presentation). As a technology the savings look good.

Non-Energy Benefits

- They could cause inconveniences
- The products in this category are qualitatively different from one another and the energy efficient product may or may not provide the specific services, functionality, games, etc. that the customer is looking for. We're not talking just apples to oranges, we're talking about an Apple to Microsoft comparison.
- Increasing the capability of these systems will have a great benefit to everyone. (just ask Bill Gates)
- Could result in industry standards that improve inter-connectivity of devices/services to reduce the number/complexity of devices needed to provide desired services to end users.
- Some advantages to the DVR on the server, instead of local DVR.

Technology Readiness

- The technology appears to already be there in many cases. The question is on whether the laggards can be brought around or whether a new technology will come along and make the whole question moot.
- We have a ways to go before we can completely map out a path to significant system-level energy savings.
- Sounds like the market is making these products available, but the barrier remains regarding all the units that are in use that do not have a cost effective early retirement option.
- As Gregg mentioned, there are some barriers for service providers

Ease of Adoption

- End user has no choice or information, as indicated in the presentation. It was supposed that homeowners would choose different cable providers based on the STB efficiency, but there is no way that will work. Ever. People get the service that is available in their area, which is often times one or two providers total.
- Devices may not be owned by customer and the next technology may be cloud instead of in-home.
- This is a national issue. Time and energy would be better spent on establishing national electronics EE standards rather than focusing on set-top legacy products.
- Very good for new subscribers that receive an ENERGY STAR 4.1 or Voluntary Agreement product, but poor for end users that already subscribe to a provider with a business plan that involves a certain expected product life.
- There is some disadvantage to early replacement - may involve technical support on site

Value

- If this were actually available to homeowners through any provider, it would be a good value. There is no program opportunity here, but hopefully there is progress made at the standards level.
- Uncertain because it is generally not the owner making the purchasing decision. This may change if labels included all the related costs.
- Assuming it's a like-for-like replacement, the newer product will save energy and will probably have additional features likely to appeal to customers.
- Once this is in the market I am sure that it will be adopted.
- The overall energy savings for the owner for efficient set top boxes isn't huge, this is more of a regional benefit product. It would be interesting to further explore system-wide network strategies and technologies.
- Will likely not increase the total cost of service significantly, relative to bandwidth and other charges.

Reduce Appliance Standby Loads

TOTAL AVG SCORE	2.9
Energy Savings	3.0
Non-energy benefits	2.1
Tech Readiness	3.2
Adoption Ease	3.1
Value	3.2

Energy Savings

- New functionality is coming out all the time, and any effort spent on this will not bear fruit before the issue becomes obsolete. The things that use the most power in standby are the exact things that homeowners will not leave plugged in to the smart strip. It is too quirky for reliable use, especially with low load devices.
- This is a growing consumption area. End use incentives are not the answer. National and manufacturer standards are needed. We need to join with other entities to tackle this.
- In this case, per-unit savings might be small but the impact would be big if new standards were set. If this question were worded to reflect that, I would rate it a 5.
- As Iain Walker pointed out, the individual loads are very small, but for a given household or building, they can add up to very large numbers. So if approached in the right way, the savings potential is significant.
- The presentation overstates the impact of this effect. It is true that many uses have energy signatures in the middle of the night but only a few of them could be attributed to "Vampire loads". In general the scale of this problem is a part of the RBSA metering results where many electronic uses were metered. The overall impact of standby mode for TVs and STB (together) is less than 50 kWh/yr For computer system the metering suggests about 20 kWh/yr (CPUs and Monitors). The impacts of gaming systems are less than this but only about a third of the houses even have those devices. If you throw in night lights and clocks and other digital displays (usually far less significant than the electronics) you might gin up a 100 kWh/yr effect. Not all of this could even be affected by any sort of program. The best you could hope for is maybe half of it with manufacturing standards and jawboning. There are big savings available in the residential sector, yet this target is the small side of trivial.
- In aggregate, there are probably good savings opportunities associated with reducing connected loads that have not been addressed, but it may not be very significant for the end users. It is difficult to assess the potential reduction opportunities if we still want some power usage for DR capability.
- This question is biased toward equipment that uses a lot of energy per unit. If you took out the phrase "per unit," I'd score this Good to Very Good.

Non-Energy Benefits

- It could cause inconvenience for devices that need to wake from lower energy states.
- Non-energy benefits are a little unclear - except the benefit of replacing older devices with newer devices that have more/added features.
- I don't think there are non-energy benefits for the end-user. Again, as Iain Walker pointed out, many of the benefits, energy and non-energy, accrue to the public.
- The reason that we have these standby loads is for occupant convenience. The NEB would be more inconvenience (I hope that isn't the market stance we intend to use).
- Reduces vampire loads. STBs cost a user $10-20 in electricity without them knowing it.

Technology Readiness

- My personal experience with this product has been that even if one person in the home is diligent and committed to using it, the others likely will not be. These need to be modified so that they actually reduce energy without creating a negative experience for the homeowner.
- It is sort of ready -- there are many products -- most have fairly small loads but each could be ready -- and might be ready without any action
- Many new products are already capable; lots of options, eg smart plugs, for existing devices

- Experience with ENERGY STAR TVs shows that electronics manufacturers can be very responsive if approached in a way that supports their design and implementation schedules. Appliance manufacturers may not be quite as responsive, but they probably won't be sluggish in wanting to meet new quality standards before the competition.
- For some products and systems, there are alternatives available now, if they can be identified (a big barrier in some cases). For others, we may have to wait a bit for more less-consuming models.
- I believe the manufacturing standards, especially for appliances, are trying to address the stand-by loads. I have every confidence that if they are included in the ratings there will be progress (of course we should remain mindful of the size of any benefit here).
- Need to identify the connected loads that would be targeted, and then need to work upstream to develop voluntary and/or regulated specifications.
- The technology is there, just needs governments or other large organizations to influence the market at regional, national, and global scale.

Ease of Adoption

- Plugging it in correctly is an art.
- Needs to have turnover of existing devices.
- It’s not a plug and play into the BPA end-use incentive structure.
- It’s low cost, simple to install.
- If these are changes within appliances, customers should be able to adopt them without realizing it. If they are only available in high-end products, then there will be significant barriers.
- In most cases, end-users should be able to adopt the more efficient model without loss of functionality.
- Consumers don't currently have a choice for standby load alternatives for connected loads that have not been addressed. If these currently ignored connected loads do get addressed through voluntary agreements or regulation, there likely would still be little to no consumer choice.

Value

- It’s an expensive product with very long time to payback.
- It’s the standby tail wagging the electronic device dog. People do not purchase these devices based on energy use and energy use is modest -- even for the "hogs"
- Lower energy cost for consumer
- Assuming the new technology has little cost impact, there's only an upside.
- As long as there is little or no loss in functionality, this is always a good buy, though perhaps not on an early replacement basis.
- Neither the owner nor the utility have much of a benefit here.
- I think the benefit would be more for the region than for the owner.
- Reducing standby loads reduces cost of operation.

3-Function Heat Pump

TOTAL AVG SCORE	2.9
Energy Savings	3.8
Non-energy benefits	2.8
Tech Readiness	2.6
Adoption Ease	2.8
Value	2.6

Energy Savings

- Really significant savings.
- Savings seem to be reliable, but cost is higher than is desirable.
- Not sure about "reliability" without seeing results from more homes with different occupancy and water draw patterns.
- I have a lot of confidence in the savings, especially for the CO2 systems. If I were grading only the Altherma system, I would have said "Good" because the savings depend so heavily on competent contractors who know how to design and spec the balance of the system, and program it correctly.
- The savings for space heating depend on the basecase insulation level and other interactions with the occupant and supplemental fuels. These effects can be expected to reduce savings substantially (30%) yet the claimed savings do not take those effects into account. I am assuming that this is a system that would generally affect new homes. Given that population and the insulation requirements of the codes I would purpose that a more realistic base case should be developed.
- The savings shared in the presentations look pretty amazing and I think the DR value should not be overlooked. I would be curious to see what the savings would look like in a new construction scenario as this sector may be the most likely to be the early adopters (this is what we've seen with the Altherma at least).

Non-Energy Benefits

- Benefit of having fewer outdoor units, so less space used outside and fewer things to maintain. Benefit of quicker water heating.
- Radiant floors and low load homes do not go together well. In order for floors to feel warm there needs to be enough heat loss to justify warmer water temperatures or the radiant floors feel cool. This negates one of the prime benefits to a radiant floor heating system – warm floors.
- The answers are different for each technology. The CO2 system has the advantage of being very capable for every climate zone in the PNW, and the advantage of using a superior refrigerant, with no electric resistance back-up required. So in my mind, the CO2 system has "Excellent" non-energy benefits, while the Altherma has "OK" non-energy benefits.
- With exterior heat pump it avoids the comfort issues inherent with one-piece heat pump water heaters. The CO2 refrigerant is a dramatic advance over HFCs in terms of GHG impacts. Having no field installations for refrigerant means that these could conceivably be installed by a regular plumber and also allows for fewer opportunities for leakage.
- As far as I can tell there was no NEB mentioned in the presentation. Basically the system is a fairly high function heat pump which provides heating and cooling. The NEBs might be a reduction in wood heat, an improvement in comfort and an efficient cooling system. All of these are available from DHPs but their applicability to this technology is not as clear since it is generally a new construction measure.
- Answered per DR value and significantly lower global warming potential of CO2 refrigerant

Technology Readiness

- Will need to develop the installer network
- Not much equipment available, probably due to high costs and the availability of other more attractive technologies.
- Need to see a little more data. Getting close. Works overseas
- The Altherma is ready now, and many systems have already been installed. The CO2 is less ready right now, but should be ready within 18 months or so.
- They have the same siting issues as other split systems. The potential to install a single product to cover DHW and space heating may prove to be appealing to builders and home owners.
- This would be a stretch since its status as a niche technology has restricted the number of installers. At the installation price I would be surprised if that changed
- Altherma is already available, sounds like the Sanden will be available in the near future. Cost will likely remain a barrier for some time regarding widespread use.

Ease of Adoption

- Doesn't require change of daily behavior on the homeowner's part. Components displace existing components.
- Expensive and disruptive
- Either of these systems can be applied to existing hydronic systems or to forced air systems. But the CO2 systems are an outstanding replacement, in any climate, for almost any kind of system, especially forced air.
- In some ways easier than DHPs and HPWHs. It will still be a case of each application having its own challenges. May not prove to be a universal one-for-one replacement for existing systems.
- Retrofit adoption would be Poor, and new construction would be Good
- There is a learning curve associated with new systems, but it shouldn't be a huge barrier

Value

- Very long payback period, but that is the case with all new technologies. It is on par with GSHP for total installed cost, though the applicability is much greater. Could be especially useful in those cold climates where air source heat pumps are not normally considered a reliable option and, if GSHP isn't an option due to site conditions, homeowner would have installed electric forced air furnace.
- There are better, lower cost alternatives available.
- In appropriate applications it can provide good value
- Systems are currently too costly.
- "Good" for the Altherma, in the right installations, and "Excellent" for the CO2 systems.
- I will likely switch my home over to a CO2 air to water heat pump in 2015. I think it's the best, most versatile, most consumer approachable heat pump design to come along so far.
- COP of 2.5 for $15,000 doesn't seem like a good bet.
- Assuming that wider adoption would bring more equipment choices to market and drive down costs. Current conditions would merit a Poor rating.
- Assuming installation costs level out once the learning curve issue is overcome

Upgrade Firmware for DHP

TOTAL AVG SCORE	3.6
Energy Savings	3.4
Non-energy benefits	3.3
Tech Readiness	3.4
Adoption Ease	3.9
Value	4.0

Energy Savings

- These upgrade can improve the energy savings from DHPs with virtually no added cost for new units
- From the presentation, it's not quite clear what the energy savings are over a year of operation. Cycling and power level changed but the overall effect on energy use not proven. I think the current study that is underway should provide more info so we get a better answer.
- I'm not sure the savings from this measure were quantified at all. It is important to low energy houses that this technology be effective and that the capacity installed (assuming it is correctly sized) is effective. I think in that sense it is an extremely useful approach.
- Early estimates say 300-500 kWh per year, depending on system capacity and the degree to which the system cycles poorly under low-load conditions. This would add approximately 15% to the regional estimates of energy savings from ductless heat pump technology in displacing electric resistance heating.
- I think Charlie estimated 200-300 kWh per year savings in a low load home, so there might be opportunity for significantly more in retrofit applications. We should also consider the impact of possible increased measure life as a result of less cycling.
- Significant, yes. Reliable, not without continuous M&V.

Non-Energy Benefits

- Longer product life, improved comfort
- The effectiveness of DHPs in low load conditions will be the basis for their adoption as a cost-effective HVAC system. This appears to be an important element in that process.
- The chief non-energy benefits are extended system lifetime and lower system noise levels.
- Longer low-speed equipment cycles should prolong equipment life, increase DHP contribution to whole-house space conditioning, improve end user comfort and overall satisfaction.

Technology Readiness

- Just a matter of modifying the code
- Manufacturers still need to show that the new firmware is good
- Depends on the manufacturer. Sounds like some are ready and others are still evaluating the problem. Manufacturers need to be pushed.
- This is a manufacturer-by-manufacturer question. Fujitsu is scaling up now, Mitsubishi should be ready by the end of this year, and the rest have yet to learn of their problems, as far as we know.
- Looks like all manufacturers are on board and solutions are either ready or soon to be ready.

Ease of Adoption

- Should just be a matter of pushing out the new code

- Good. Deploy thru contractors
- For new equipment, very good. For existing equipment somewhat more difficult, but not impossible.
- Change can be made through a simple service call
- It seems like an intervention from the manufacturer and maybe the utility will be required.
- The savings should come from a very easy firmware change to the system.
- As a retro measure, this should be quite easy and should be covered under warranty. If it's an added cost, customers will have to be convinced that it's a worthwhile cost for them to bear which may be a hard sell if they're already seeing savings and have already spent more than they wanted to on the system. Also, the upgrade may or may not benefit them if they aren't in a low-load home or if they operate the unit more like the Koreans do. Would it be just as easy to train people to use their DHPs more like they were originally designed to be used?
- Should be relatively easy for new systems, might be more challenging to address the thousands of installations in the region

Value

- Don't have to market to end user. One level higher. Consumer gets EE benefit.
- Yes it has good value, especially for new equipment. No added costs. Depending on the energy savings for existing equipment it could be a winner as well.
- Should be free to the end user
- This is probably essential for the use of the DHPs especially in new residential construction, including multi-family.
- This depends on who pays and whether the home is a low enough load home that it will benefit from the upgrade.
- Should be a warranty issue

Passive House

TOTAL AVG SCORE	3.0
Energy Savings	4.1
Non-energy benefits	3.3
Tech Readiness	2.0
Adoption Ease	2.4
Value	3.1

Energy Savings

- I believe the rigor required by the PH process will result in considerable energy savings.
- Potential seems very good, and the modeling capability for various climates will help when it becomes available
- The savings may be quite large for individual homes -- although they were dramatically overstated in the presentation implying a 5 year payback when it's probably closer to 50 years in most homes. But it's also not clear that it will ever be more than a niche market.
- The energy use for heating and cooling per square foot is very clearly defined, and is much lower than conventional practice. Of course, the total energy use per home will still vary, based on occupants and plug load.

- People may argue about whether we should attempt this level of savings, but I'm pretty confident that the Passive House system can deliver the savings.
- I haven't seen a lot of data that reconciles actual performance with the model, but from what I've gathered, the PHPP does a good job with heating and water heating loads, but underestimates plug loads.
- I don't know how significant the savings are because it seems that a Passive House will generally not be a huge house, so it might be a big percentage savings of a not so big consumption number. Further I am curious about the point of diminishing returns in our climate. Can you get halfway to Passive house and capture 80% of the savings?

Non-energy Benefits

- I believe the durability of the envelope and healthy indoor environment are considerable benefits.
- Done well, Passive House designs improve comfort and IAQ.
- One issue with Passive House is that they almost never have a kitchen exhaust to outside. This means that they don't comply with ventilation standards and the IAQ will be severely impacted because we know that particles are the #1 contaminant of concern in residences and that cooking is a major source of particles (see recent work by LBNL on these topics). There are ways around this issue if the ERV can be installed to have sufficient general kitchen exhaust with an override switch for occupants, but we have not seen this much in practice.
  A second issue in many US climates is summer time overheating. There is no cooling system and any solar gains through windows that help to make the house passive in the winter can, and do, lead to summer overheating. This is a serious thermal comfort issue. As with kitchen ventilation, there are ways around it - but these are not yet standardized in passive design.
- House will hold heat longer and surface temperatures will be higher. But I have big concerns about building homes at 0.6 ACH in terms of the inability to have exhaust fans in the home -- range hoods and dryers can bring the house to -50pa. The use of recirculating range hoods may have severe IAQ impacts and dryer issues may make them outside the mainstream.
- These are good selling points, but maybe not documented well enough for the Benefit/Cost Ratio.
  - Enhanced occupant comfort, thermal and acoustic
  - Well-built, 3-party-certified construction quality probably has fewer complaints and longer durability.
  - Resilience to extreme weather and grid outages.
  - Resilience to future increases in energy prices.
  - Resilience to operator behavior. (even if you leave a window open sometimes, or crank up the thermostat in winter, the energy bill is still tiny compared to a conventional building)
- Comfort and a healthy indoor environment are a big deal and I think these houses can deliver on that.
  - 1) Fresh, clean air
  - 2) No ""outside walls"" which are colder than other walls.
  - 3) Homogeneous interior temperature
  - 4) Slow temperature changes
  - 5) Quick return to normal temperature
- I think comfort and control are delivered through Passive House, but I also think they can be delivered through less rigorous means. I do like the attention to detail regarding moisture strategy with super insulated building components (durability benefit), but again, I don't think you need to go all the way to Passive House to incorporate this thinking into a project.
  - One potential non-energy disadvantage that was pointed out by an architect friend (who is a PH advocate) is the disconnect that occupants can feel with the outside as they are essentially

isolated in an air tight box. You won't hear the rain, kids playing out side, or bird songs. For some people this would be a benefit, for others not so much.

Technological Readiness

- While the PH product has been proven to gain considerable traction in Europe, most of that success comes from embedding the performance targets in the building code. Considerable change is needed in the construction industry to adapt to wall systems and procedures required to meet PH criteria.
- Experience in NE is that many builders and contractors are resistant to new approaches--suspect that's true in NW as well.
- There is a steep learning curve for contractors the start. If a good contractor base is built up over several years this will be less of an issue.
- Many new and expensive and imported technologies. $8k ERVs? triple glazed low-e super tight windows? Unconventional wall assemblies and even attics
- Multiple designers and builders have been building these homes in the PNW for years. If an incentive encourages mainstream builders to join them, the PHIUS has training available. The modeling software is very useful and usable by experts, but not ready for casual users yet.
- There aren't a lot of builders who are ready to build like this and there are still some equipment issues, most of which I won't go into here. To a lesser extent, the equipment issues are something that we at NEEA have to deal with in the NSH initiative, too.
- This seems to be different than business as usual by a wide margin.
- With the exception of Portland and Seattle, there probably aren't very many PH consultants across the Pacific NW and there are even less Passive House raters. There is still a fair amount of confusion between PHIUS and the European based PH organization. In Eugene we have one project that was pre-certified, and never got the actual certification. Then we worked with a MF project that did achieve PH certification (through Europe). This added a lot of expense to the project (some subsidized by EWEB and City of Eugene), and the architect and project owner both said they wouldn't do it again. The same PH consultant worked with both projects, and he has done a few projects since that didn't incorporate PH but they focus on the same principles. Finally, it seems like a lot of work needs to go into building the energy model, and it had to get reviewed by the certifying organization. If anything on the project changes (which is pretty much standard) changes need to be modified and reviewed. The MF project we worked with had a lot of this going on which used a lot of contractor time. It was a steep learning curve and I think in general PH is a good option to have at an extreme end that might make some other things like exterior insulation and HRVs not look so bad to conventional builders.

Ease of Adoption

- The design rigor is so exhaustive that I believe this to be a real barrier to wide-spread adoption. Simply creating a thermal bridging library for different wall systems or unique features is very time intensive. And I question the need to 'chase' air tightness 0.6 ACH - let alone the 0.3 ACH recommended in the presentation. A short coming to PH - as I see it - is that you either pass or fail, getting close doesn't count for anything because there is no scale.
- Depends on if you are comfortable with and have the $$$ to hire a PH consultant. Then all can be OK. It's too complex to get right otherwise.
- Many new technologies that need to be learned by many different trades that are slow to adapt.
- This requires learning and practicing new procedures. It's not just a matter of choosing a different widget to buy.

- If by "end user" you mean builder, it will take a lot of training and cajoling to get them on board and to help them learn how to do this well. I know a number of Passive House builders and there is a steep learning curve at the beginning and a lot of places to fall short and not get certified. Also, while they don't focus on it too much, it's really important to build a basic box without a lot of windows or design character (unless you more or less glue it onto the outside of the structure (without penetrating any of the air or wind barriers, of course) if you want to achieve certification. Many of the homes now being built, spec or custom, would struggle to achieve certification simply because they're just too complex. This can be overcome, with added cost, of course.
- I believe that PH can become easy, in fact I've specifically heard that from a Portland builder that regularly does it. But they regularly do it on expensive custom homes that are only a reality for a very small portion of the population. I don't think it is an easy thing to adopt both in the technical aspects (i.e. taking a builder who's never had a blower door test down to 0.6 ACH50) and the design aspects. Marrying the PH calculator to stock plans and architects imaginations probably isn't an easy task.

Value

- I am sure that a PH is a great home to live in and will have much lower energy bills - I just question the cost effectiveness of this path compared to others, like Next Step homes.
- It's a good buy if homes get built properly.
- One caveat is that much of the benefits are not related to energy savings - they are that people feel good doing it and want a passive house. And that's OK but we need to realize that it’s not justifiable in $ terms. Getting to net zero ready homes (similar to DOE challenge home or the projects underway in CA by utilities) is most of the way to passive house and gets almost all the benefits for a much smaller cost. Diminishing returns is a killer here. For example, setting a tightness limit of 1 to 1.5 ACH is a small energy penalty c/w 0.6 ACH (particularly as we have to mechanically ventilate anyway) but takes substantially less effort, time and cost.
- I think the incremental costs are more like $40-$50k per home or greater and the annual savings are more like $700, yielding a payback far in excess of 50 years. The example in the presentation of saving 70% of a $200/mo energy bill implies annual savings of about $1700/year in a $150k home. But annual energy bills are much less than $200/mo in code built new homes of that size. The one success story poster-child home in Salem had savings of about $750/yr in the first year and less in the second year when occupancy went up to 3 people (and using a modeled baseline code home). So the savings are less than half what the example claims. The incremental costs in the slide were just $18k -- but i don't see how you could possibly afford the ERV, super windows, shell sealing, super walls and attics, and certifications for even twice that amount.
- The only downside is the high first cost. That's a perfect opportunity for a utility incentive.
- Quite a lot of cost, and seriously diminishing returns on the savings. However, if the new climate-tailored performance specs reduce the specs somewhat - maybe closer to the Next Step Homes specs - then I'll want to re-think this answer.
- Over the life of the measure very good. Might be more difficult for utilities since first year energy savings is how we will support it.