

September 2015

Programs or policies to encourage Passive House in North America

by Tom-Pierre Frappé-Sénéclauze

1. Procurement policies

Affordable housing policies (various locations)

Developers applying for tax-credit funding for multi-unit affordable housing projects must compete to access this funding. Qualified Allocation Plans (QAPs) establish scoring criteria to assess projects; some grant additional points for Passive House projects.

- **Pennsylvania Housing Finance Agency (2014):** The agency grants 10 points (out of 130) for development that meet Passive House certification requirements under iPHI or PHIUS.¹ As a result, in the first year of the policy 39 of the 85 projects submitted (46%) were PH. The agency funded seven PH projects, totaling 422 units. Cost increment per square foot was less than 2%.²
- **New York State Homes & Community Renewal (2015):** The agency awards five points (out of 100) for projects seeking Passive House certification or other green standard (Enterprise Green Communities, LEED, National Green Building Standard).³ Given the industry's familiarity with LEED, we suspect that uptake of PH from this policy will be significantly smaller than that resulting from the PHFA policy, which allocated points specifically for PH certification.
- **Another 35 states:** Conversations are underway with housing agencies to also incorporate PH scoring in their QAPs⁴

New York City Passive House requirement for public buildings (under committee review)

If passed, this bill would require that City capital projects (new buildings, additions, or renovations) above two million dollar (plus inflation)⁵ be built to Passive House standards (either PHIUS or iPHI).⁶

2. Changes in land use for additional density and floor space

City of Vancouver green rezoning policy (2010, revised 2014)

Rezoning for large commercial and multi-unit residential projects must meet Passive House, LEED Gold (including 22% reduction in energy cost over code), or Living Building certification. This policy impacts 60% of square footage developed in the City of Vancouver (an estimated 2.6 million square feet of new development each year).⁷

City of Vancouver thick wall exclusion (2010, revised 2015)

This policy allows all building types to exclude the area used for insulation that exceeds minimum code requirements in floor space ratio calculation. Maximum limit on exclusion was explicitly based on the amount of insulation deemed required to achieve PH. Relaxation to other regulations used to control bulk and massing in single family developments (height, yard, setbacks, etc.) is also being considered (see below).⁸

City of Vancouver setback allowance (in development)

This would allow some relaxation in height, front and backyard setbacks for one- and two-family dwellings to recoup indoor useable area lost because of thicker walls for PH certified buildings.⁹

City of Seattle setback allowance (in development)

Where allowed by building code and fire code minimum fire separation distance requirements, required setback distance from adjacent property lines may be decreased by a maximum of 4 inches, and the maximum allowable roof height may be increased by 8 inches, only for the purpose of adding insulation to the exterior of the existing building structural frame. The Code Official may prohibit additional roof height encroachments in view-sensitive districts.¹⁰

3. Streamlining permitting and inspection

San Francisco priority permitting (2014, revised 2015)

The planning department offers accelerated permit processing to multi-unit residential (or large commercial) building that are Passive House Certified (iPHI, PHIUS, or EnerPHit), LEED Platinum, or Net Zero Energy (as defined by Living Building Challenge).¹¹ Policy used to include SFD; this option had significant uptake but was removed because it mostly benefited better-off homeowners and increased delays for projects more aligned with affordability objectives. A handful of larger projects are applied for each year, mostly under the LEED criteria.¹²

City of Vancouver building officials training (2015)

To ensure there is no delay in processing applications for Passive Houses, the City of Vancouver will provide training on passive design and construction to city staff. This will primarily engage staff in Housing Review and Inspections, but also in Development Review, Development Planning, and Building Review. Staff have created a draft specialized application process for Certified Passive House projects for one- or two-family homes.¹³

City of Vancouver Passive House equivalency (2015)

The City also made some allowance for PH-certified HRV, windows and door components that might not have equivalent North American certifications.¹⁴

4. Policies driving improvement in building envelope construction practices

Washington State and City of Seattle air-tightness requirements (2009, revised 2012)

2012 Washington State Energy Code (WSEC) and the 2015 Seattle Energy Code requires air leakage not greater than $2 \text{ L/s}\cdot\text{m}^2$ (0.40 cfm/ft^2) at 75 Pa and air-tightness testing for all new houses and additions¹⁵ and for new commercial buildings.¹⁶

Houses are required to pass the test prior to occupancy. Commercial buildings can still get their certificates of occupancy if they fail the test, but builders must first seal leaks “to the extent practicable,” and send in a report of what they corrected. Tests must be done in accordance to ASTM E779¹⁷ or an approved equivalent standard.¹⁸

Key learnings: this testing protocol is significant burden for the first one or two projects, but by the third project most contractors have figured out more efficient methods and are able to work with subcontractors to reduce leaks without too many issues. Scheduling is a big concern, and has to be carefully planned as the testing firm needs all contractors out of the building for a significant period of time which can be hard to schedule with fast-tracked buildings. It is possible to test buildings in sections, rather than all at once,

but the general contractor needs to plan in advance to make sure that the dividing line between the segments can be fully sealed off. Having absolute air-tightness requirements creates a risk that the test results could be fabricated to satisfy the building inspector, especially with houses. Third party certification can mitigate this risk.¹⁹

City of Vancouver air tightness requirement for one and two family dwellings (2009, revised 2014)

Since 2009, the Vancouver Building Bylaw (VBBL) requires air tightness testing for one and two family dwellings. The testing must be conducted by a Certified Energy Advisor using EnerGuide Rating System procedures.²⁰

The 2014 VBBL added minimum air tightness requirements (leakage no greater than 3.5 air changes per hour), and new testing requirements: a pre-assessment based on plan (to be submitted for building permit), and a pre-drywall blower-door test and a Thermal Bypass checklist (to be completed by a certified energy advisor before the City's insulation inspection). Copy of the final EnerGuide Report must be submitted at the time of final inspection, and remediation might be required if the home does not meet the 3.5 ACH target.^{21, 22} This addition of a pre-construction assessment and pre-drywall site visit by a CEA has provided significant opportunity to engage with building and increase awareness of energy efficient building practices.

City of Vancouver, thermal bridging consideration requirements (in development)

Produced by Morrison Hershfield, the Building Envelope Thermal Bridging (BETB) Guide provides a catalog of common building envelope assemblies and interface details, as well as procedures to calculate overall thermal performance (including thermal bridging effects) for these details in mid- and high-rise buildings.²³ The BETB Guide is intended to be a living document, capable of adding new assemblies annually or perhaps even semi-annually, based on demand.

The City of Vancouver is in the process of developing procedures for integrating the BETB Guide into the design stage in preparation for permitting. The approach being considered would still allow architects to select any assembly types allowed under ASHRAE 90.1-2010 (Table 5.5-5) but to require calculation of the overall effective R-value for each of the distinct assemblies, as per the BETB Guide. These values would then be used in the normal design process for thermal modeling and sizing of mechanical systems. The City of Vancouver is likely to continue asking design teams for the various effective R-values. This is likely to be disclosed on the energy checklist, and/or with the BETB calculation spreadsheet.

The hope is that when architects use the BETB guide they will find wall types that give them the same look they want while providing more efficient envelopes. Another potential is that if mechanical system designers have more confidence in the accuracy of the envelope performance values, they will consider reducing the safety factors, used to oversize equipment, meant to compensate for unknowns such as a building envelope's thermal bridging.

Another alternative being considered is the possibility of de-rating²⁴ the ASHRAE Table 5.5-5 values and require compliance based on attaining targeted overall effective R-values that include thermal bridging rather than just the "clear wall" values. This would make thermal bridging a performance factor to be considered for compliance. This is not being considered for the short term; the hope is that requiring the use of the guide will, over time, lead architects to evaluate their assembly options beyond the clear wall value and choose the better performing assemblies.

5. Enabling policies and political vision

President Obama energy efficiency and renewable energy in residential sector announcement (2015)

This announcement specifically cites the inclusion of the Passive House track in New York State's Home and Community Renewal 2015 RFP.²⁵

New York City's low-carbon building strategy (2014)

Mayor Bill de Blasio office's released *One City: Built to Last* in 2014, articulating a vision for dramatically reduced greenhouse gas emissions from buildings (20% by 2025, 80% by 2050). It states that New York City will look to "Passive House, carbon neutral, or 'zero net energy' strategies to inform the standards."²⁶ A technical working group was struck to devise plan to meet these targets; recommendations are expected early in 2016.²⁷

Marin County, California, building code (2013)

Marin County code encourages "green building" by authorizing the establishment of incentives for "green building compliance", citing Passive House Institute as one of three eligible standard-setting bodies (along with Build It Green and the U.S. Green Building Council).²⁸

6. Cash incentives, tax credits, fee rebates

Baltimore County High Performance Home tax credit

This credit can be up to 100% refund of property taxes for three year (or five for a carbon neutral building) for single and multi-unit residential building achieving energy savings greater than 30% as attested by a PH Certified Consultant.²⁹

Barriers and solutions to near Zero Energy Buildings (NZEB) and high performance envelope in Europe and North America

Based on findings of the PassREg project in Europeⁱ and on twenty interviews with North American practitioners and policy makers (stars indicate frequency in interviews: * = 1-2 mentions, ** = 2-4 mentions, *** = 5 + mentions; no star: barrier mentioned in European literature but not mentioned in interviews)

| Barriers | Solutions |
|--|---|
| 1. Regulation and political agenda | |
| <p>Lack of political will, motivation for transition</p> <p>Lack of clear direction, vision, targets & insight in progress towards vision and target</p> <p>Lack of stakeholder consensus</p> <p>Lack of knowledge with policymakers and public servants</p> <p><i>Particularly: permitting and inspection staff</i> ***</p> <p>Procurement policies prevent public sector to lead in innovation *</p> <p>Existing regulations misaligned with PH design approaches (see extended list below) ***</p> <p>Energy efficiency standards not aligned with desired outcomes *</p> | <p>Structure</p> <p>Stable and continuing policy on energy efficiency at national and regional levels</p> <p>Regional roadmap, involving all relevant regional stakeholders</p> <p>Incentives or funds supporting a high standard of energy efficiency</p> <p>Examples of PH in government and public buildings, including PH procurement policies</p> <p>Clear definition on NZEB and its measurement instrument(s)</p> <p>Culture</p> <p>Regular study tours to educate and inspire policymakers and public servants through examples of successful projects and happy inhabitants</p> <p>Work practices</p> <p>Regulations demanding a high standard of energy performance and delivered quality of the systems</p> <p>Rezoning and rental/sale of public land used to negotiate higher efficiency in private developments</p> <p>Ongoing education for permitting and inspection staff; PH training</p> |
| 2. Business case and financing | |
| <p>Risks and benefits accrue to different parties (split incentive) *</p> <p>Improved energy performance and non-energy benefits not recognized in appraisal process **</p> <p>Incremental cost due primarily to (in order of importance, most common ranking):</p> <ol style="list-style-type: none"> 1. Materials: windows, additional insulation/framing, HRV *** 2. Innovation: additional design cost for first 2-3 projects (decreases after that); cost of energy modeling *** 3. Labour: contactors that have not built yet to PH standard may factor in a safety buffer * <p>Time required to keep abreast of and apply for incentive programs; delay in receiving payment**</p> <p>Existing incentives programs misaligned with PH, adding redundant requirements *</p> <p>Tax disincentives as improved energy efficiency increase property taxes *</p> <p>Cost of energy/carbon too low *</p> | <p>Structure</p> <p>Presence of stable financial mechanisms supporting market development for PH/NZEB</p> <p>Presence of tax remissions for certified NZEB buildings</p> <p>One-stop shop models for incentive distribution</p> <p>Culture</p> <p>Habit of evaluating and calculating issues from a long-term perspective instead of short term (e.g. life cycle costing instead of initial investment costing)</p> <p>Work practices</p> <p>Presence of integral and functional tendering, like tendering based upon the design-build-finance-maintain (DBFM) method, leading to a high standard energy performance</p> <p>Rental and leasing contracts include heating & cooling costs</p> <p>Presence of a higher valuation of property with NZEB standard (requires comparator data and price signal)</p> <p>Use of investment and decision models supporting sustainable NZEB design and investment (e.g. LCC and/or DBFM-methods)</p> <p>Use of financial arrangements and contracts based on guaranteed performance</p> |

| | |
|---|---|
| 3. Capacity | |
| <p>Lack of interest, motivation to embrace PH/NZEB</p> <p>Unfamiliarity of suppliers with PH/NZEB</p> <p>Resistance of suppliers/builders to change the local building tradition *</p> <p>Lack of awareness and familiarity for design professionals ***</p> <p>Difficulty in finding trained trades and subcontractors ***</p> <p>Design-build projects lack integration; integrated design still niche, not the norm **</p> | <p>Structure</p> <p>Training facilities present</p> <p>Culture</p> <p>Presence of a dissemination strategy for PH knowledge, including a strategy for change management of local building traditions where necessary</p> <p>Presence of supported professional networks and trade alliances for information sharing</p> <p>Work practices</p> <p>Availability of education material for designers</p> <p>Availability of material (or on-site training) for contractors</p> <p>Availability of education material for private investors, public building owners, manufacturing industry, political decision makers and public servants</p> |
| 4. Knowledge | |
| <p>Insufficient knowledge base</p> <p>Inaccessibility of knowledge base</p> | <p>Work practices</p> <p>Best practice examples of PH/NZEB</p> <p>Accessible regional source of information about adaptation to climate, to traditional architectural values and to other local conditions</p> <p>Accessible source of information on PH solutions for building services, planning and design</p> <p>Integrated approach to designing and building</p> <p>Streamlined PH-consulting scheme for house owners and investors</p> |
| 5. Applied products | |
| <p>Lack of suitable variety and competitive market for high performance products (whether manufactured in NA or imported) ***</p> <p>Imported products do not have North American certification required by codes ***</p> <p>Testing procedures for locally manufactured products not trusted for PH **</p> | <p>Structure</p> <p>Presence of incentives for the industry to increase the local availability of high performance products</p> <p>Recognition of equivalencies between North American and European certification standards</p> <p>Work practices</p> <p>Local development and availability of products suitable for PH</p> <p>Manufacturers/suppliers certify European products based on North America standards</p> |
| 6. Public and builder awareness of passive design and benefits | |
| <p>Misconceptions on and lack of awareness of benefits of PH by policy makers, civil servants, consumers and suppliers ***</p> <p>Lack of demonstration projects showcasing range of building types in various regions **</p> <p>PH perceived as a brand; brand issues **</p> <p>Costs and lack of appropriate manpower to execute strategies on PR, marketing and communication</p> | <p>Culture</p> <p>Marketing and communication strategy to create demand for PH/NZEB, taking into account different consumer segments and their specific characteristics</p> <p>Marketing and communication strategy to create political will and motivation to facilitate the transition towards PH/NZEB</p> <p>Work practices</p> <p>Availability of resources needed to implement marketing and communication strategy</p> <p>Measurement of progress in actual implementation of marketing and communication strategy</p> |

7. Quality Assurance

Lack of experts capable of doing quality assurance*

Lack of infrastructure to perform quality assurance*

Value of certification beyond the first 2-3 projects does not justify the cost / time investment **

Insufficient delivered quality

Improper use and maintenance of PH/NZEB

Work practices

Presence of a well-functioning regional infrastructure for quality assurance (tests, specifications and/or other specific methods)

Availability of sufficient PH/NZEB solutions for quality assurance in region (quality performance criteria sets, descriptions and procedures)

Presence of a sufficient number of experts to perform quality assurance on PH

Monitoring of PH projects in terms of indoor climate, costs, energy performance etc.

Requirements of quality performance in contracts for PH

Training provided for maintenance teams, tenancy managers and home owners

Regulatory barriers to PH in North America

(non-exhaustive list, compiled from interviews)

Land use policies

- Floor space ratio, setbacks, heights restrictions: thicker walls lead to loss of useable area
- Set backs prevent addition of external insulation for retrofit of existing buildings
- Rezoning: incentives for Green buildings commonly based on LEED
- Historical districts: Lack of local component matching historical preservation requirements
- Cantilevered balconies not counted as site coverage but balconies supported by posts are (posts needed to avoid thermal bridging)
- District energy connectivity requirements: standing charge even if not connected
- Design panel push back on energy efficient design and insistence in abundant use of glazing

Codes, permitting and inspection

- Permit reviewer & inspector not used to new type of wall assemblies (particularly for commercial buildings) and ventilation systems

Specific elements / systems causing issues:

Ventilation

- Code requirement based on exhaust by kitchen/bathroom; conflicts with continuous ventilation from HRV, synced through-wall heat exchangers, etc.
- Code limits proximity of intake and exhaust to each other and to openings or windows; incompatible with installation of wall-mounted HRVs in smaller units
- Code does not accept recirculating kitchen hoods, or combining of kitchen and bathroom exhaust
- Fire code does not accept plastic flex-ducts
- Venting requirements for elevator mechanical rooms, stairwells, and others vertical shafts
- Indoor air quality code requirements for outdoor air inlets in windows (eg Washington State Ventilation and Indoor Section 303.4.1.5)

Glazing: Windows and doors

- Imported components do not have required North American certifications (NAFS, UL).

Structural wood

- Most fire districts in NYC don't allow wood frame construction

Incentive programs

- Incentive programs require verification through energy model platforms that were not designed for high performance buildings
- Misalignment between EnergyStar and PH: ES requires blower door test of the individual units, PH requires BD test of the entire building. Energy model requirements are different (for ES performance path) and prescriptive path may not be available in future.

Endnotes

- ¹ Pennsylvania Housing Finance Agency, *Allocation Plan For Year 2015 Low Income Housing Tax Credit Program* (2014), 23. http://www.phfa.org/forms/multifamily_program_notices/qap/2015_qap_final.pdf; Pennsylvania Housing Finance Agency, “2015 Multifamily Housing Application Package and Guidelines,” Tab 03, Self-Scoring Sheet, at 173, <http://www.phfa.org/developers/developer/housingapplication.aspx>. Note that the criteria for meeting “Energy Efficiency Goals” require developments to meet Passive House Certification requirements but do not require final certification.
- ² Tim McDonald, *Developer Roundtable: Views from the leading edge of market rate and affordable housing*, Presentation at the NYPH 2015 conference, slide 48 and 53. <http://nypassivehouse.org/wp-content/uploads/2015/06/NY15PH-08a-Developer-Roundtable-Tim-McDonald.pdf>
- ³ New York State Homes & Community Renewal, *Request for Proposals: Multi-Family Programs*. <http://www.nyshcr.org/Funding/UnifiedFundingMaterials/2015/2015-RFP-MultiFamilyPrograms.pdf>
- ⁴ Tim McDonald, Personal communication, August 14, 2015; also *Developer Roundtable*, slide 108.
- ⁵ As defined in New York Charter, Chapter 9, Section 224.1 subsection b. paragraph 1 <http://codes.lp.findlaw.com/nycode/NYC/9/224.1>
- ⁶ New York City Council, Bill 701, *Passive building standards for certain capital projects and repealing section 3 of local law number 86 for the year 2005*, subdivision 1, paragraph 3(i): <http://legistar.council.nyc.gov/LegislationDetail.aspx?ID=2240482&GUID=0A9A548C-E3D9-4057-AEAC-426CA033FBBF&Options=ID%7cText%7c&Search=>
- ⁷ City of Vancouver, *Green Buildings Policy For Rezoning: Process And Requirements*, Administration Bulletin, 2015. <http://former.vancouver.ca/commsvcs/bylaws/BULLETIN/G002.pdf>
- ⁸ City of Vancouver, *Floor Space Exclusion To Accommodate Improved Building Performance (Envelope And Thermal Insulation)*, Administration Bulletin, 2015. <http://former.vancouver.ca/commsvcs/BYLAWS/bulletin/F008.pdf>
- ⁹ City of Vancouver, *Amendments to the Zoning and Development By-law to Remove Barriers to Building to the Certified Passive House Standard in the RS-1 District*, Policy Report, September 4, 2015. <http://former.vancouver.ca/ctyclerk/cclerk/20150915/documents/p1.pdf>
- ¹⁰ Kathleen M. Petrie, sustainable codes analyst City of Seattle, personal communication, September 21, 2015.
- ¹¹ City and County of San Francisco, “Priority Permitting.” <http://sfenvironment.org/article/larger-projects-commercial-amp-multifamily/priority-permitting> and City and County of San Francisco, *Priority Permit Processing Guidelines*, Administrative Bulletin, 2015. http://sfdbi.org/sites/sfdbi.org/files/AB-004_0.pdf
- ¹² Richard Chien, City of San Francisco, personal communication, August 28, 2015.
- ¹³ Sean Pander, personal communication, August 17, 2015.
- ¹⁴ Letter from Pat Ryan, City of Vancouver Deputy Chief Building Official, and Sean Pander, Green Building Manager, to Canadian Passive House Institute, March 17, 2014. Available at <http://canphi.ca/wp-content/uploads/2015/03/CMO-SUS-Passive-House-Equivalencies-Letter.pdf>
- ¹⁵ 2012 Washington State Energy Code, Residential Provisions, section R402.4.1.2 <https://fortress.wa.gov/ga/apps/SBCC/File.ashx?cid=2842>
- ¹⁶ 2012 Washington State Energy Code, Commercial Provisions, section C402.4.1.2.2 <https://fortress.wa.gov/ga/apps/SBCC/File.ashx?cid=2892>
- ¹⁷ American Society for Testing and Materials, ASTM E779-10, Standard Test Method for Determining Air Leakage Rate by Fan Pressurization (2010).
- ¹⁸ Note that SEC allows for pressurization testing or both pressurization and depressurization testing, but does not allow depressurization testing only, while WSEC allows for any of these options. For a discussion of these testing procedures, see Denali Jones, Bailey Brown, Tony Thompson and Graham Finch, “Building Enclosure Airtightness Testing in Washington State: Lessons Learned about Air Barrier Systems and Large Building Testing Procedures,” *ASHRAE 2014 conference proceedings*. <http://rdh.com/wp-content/uploads/2014/10/ASHRAE-2014-Annual-Conference-Building-Enclosure-Airtightness-in-WA-Final.pdf>
- ¹⁹ Duane Jonlin, personal communication, September 17, 2015.

-
- ²⁰ City of Vancouver, *By-law No. 9691: A Bylaw to amend Building By-law No. 9419 regarding green building strategy for one family homes, one family homes with secondary suites, and two family homes*, article 12.2.2.8 July 8, 2008. <https://vancouver.ca/files/cov/green-homes-ammendments.PDF>
- ²¹ City of Vancouver, *By-law No. 10908 A By-law to regulate the construction of buildings and related matters and to adopt the British Columbia Building Code*, article 10.2.2.12, April 1, 2014. <http://former.vancouver.ca/blStorage/10908.PDF>
- ²² See also: City of Vancouver, “Vancouver Building Bylaw 9419.” <http://vancouver.ca/your-government/vancouver-building-bylaw.aspx>
- ²³ Morrison Hershfield, *Building Envelope Thermal Bridging Guide* (2014). <https://www.bchydro.com/powersmart/business/programs/new-construction.html#thermal>
- ²⁴ Morrison Hershfield, *Accounting for Thermal Bridging at Interface Details: A Methodology for De-Rating Prescriptive Opaque Envelope Requirements in Energy Codes* (2015). <https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/power-smart/builders-developers/base-building-u-values-03102015.pdf>
- ²⁵ The White House, “President Obama Announces New Actions to Bring Renewable Energy and Energy Efficiency to Households across the Country,” media release, August 24, 2015. <https://www.whitehouse.gov/the-press-office/2015/08/24/fact-sheet-president-obama-announces-new-actions-bring-renewable-energy>
- ²⁶ N.Y.C. Mayor’s Office Of Long-Term Planning & Sustainability, *One City: Built To Last* (2014), <http://www.nyc.gov/html/builttolast/assets/downloads/pdf/OneCity.pdf>
- ²⁷ Elizabeth Hanson, City of New York, personal communication, September 16, 2015.
- ²⁸ Marin County, California, Ordinance No. 3607, November 12, 2013. Available at <http://nypassivehouse.org/wp-content/uploads/2014/12/Marin-County-Bldg-Code.pdf>
- ²⁹ Baltimore County, “High Performance Homes Tax Credit.” <http://www.baltimorecountymd.gov/Agencies/budfin/customerservice/taxpayerservices/taxcredits/performancehomes.html>

List of interviewees

| # | Name | Title |
|----|--------------------|---|
| 01 | Ken Levenson | CFO / Sales Director, 475 High Performance Building Supply (NY) |
| 02 | Tad Everhart | Energy Advisor LLC (OR) |
| 03 | Dylan Lamarr | Architect & Energy Consultant, Green Hammer (OR) |
| 04 | Timothy McDonald | Associate Professor, Temple University (PA) |
| 05 | David Salamon | Certified Passive House Designer, WRT (PA) |
| 06 | Sean Pander | Green building manager, City of Vancouver (BC) |
| 07 | Rob Nicely | President, Carmel Building & Design (CA) |
| 08 | Tomàs O'Leary | Co-Founder & Managing Director, Passive House Academy (EU) |
| 09 | Katy Hollbacher | Principal and founder, Beyond Efficiency (CA) |
| 10 | Allen Gilliland | Founder, One Sky Homes (CA) |
| 11 | Richard C. Yancey | Executive Director, Building Energy Exchange (NY) |
| 12 | Rob Bernhardt | President, CanPHI West & Bernhardt Developments Ltd (BC) |
| 13 | Rob Hawthorne | Owner, architect, PDX Living (OR) |
| 14 | Helen Goodland | Principal, Brantwood Consulting Partnership (BC) |
| 15 | Rich Chien | GreenFinanceSF Program Manager, City of San Francisco (CA) |
| 16 | Gregory McCall | Energy Policy Specialist, Building Review Branch, Planning and Development Services, City of Vancouver (BC) |
| 17 | Katrin Klingenberg | Executive Director, PHIUS (IL) |
| 18 | Elizabeth Hanson | Senior Policy Advisor, NYC Mayor's Office of Sustainability (NY) |
| 19 | John Lee | Deputy Director for Green Buildings and Energy Efficiency, NYC Mayor's Office of Sustainability (NY) |
| 20 | Brandon Nicholson | Founding Principal, NK Architecture (WA) |
| 21 | Amina Lang | International Communications, Passive House Institute (EU) |

ⁱ DNA in de bouw, *Advisory Report on Barriers and Solutions in European Regions Introducing Passive House Technology with Renewable Energy Supply*, 2015. http://www.passreg.eu/download.php?cms=1&file=D4_6_PassREg_Advisory_report.pdf