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**2010 End-of-contract review of
Beacon Pathway Research Consortium
'Housing Advances for Environmental Responsibility
and Sustainable Living'**

BCON0401

*Commissioned by the
Foundation for Research, Science and Technology*

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2010 review of Beacon Pathway Research Consortium

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Important Notice

This document reflects the confidential information provided to the review panel by Beacon Pathway Ltd, the science presentations, specific discussions carried out during the course of the review, and the guidelines.

This report has been prepared by a review panel consisting of Professor Peter Newton and Dr Richard Hawke, at the request of the Foundation for Research, Science and Technology (Foundation). Except where otherwise noted or apparent, all information used in the preparation of the report was supplied by the Foundation and Beacon Pathway Ltd. The review panel was not asked to verify independently the accuracy of the information provided and accordingly provides no guarantees as to information accuracy or sufficiency. In particular, information supplied to the review panel included statements, opinions, estimates, assumptions, projections and analyses made by others that may or may not prove correct. Where information supplied has been inadequate, the review panel has sought further information, but cannot be certain that all pertinent information has been supplied to it.

We have approached this review in good faith, with the objective of providing constructive comment from our combined experiences. Accordingly, while the statements, views, analyses, estimates and projections contained in this report have been developed carefully, no representations are made by the review panel or its respective members as to the accuracy or completeness of such statements, views, analyses, estimates and projections. In particular, no representation is made that the development and commercialisation of projects reviewed will be successful.

Executive Summary

Background

For countries such as New Zealand, a home represents their residents' major lifetime purchase and asset as well as where a significant percentage of their time is spent. The level of sustainability, affordability and quality of environment provided to its occupants is therefore a significant issue. The built environment, of which housing is a major component, is also one of the nation's major assets. At the beginning of the 21st century major challenges face the housing sector that relate to the quality of the stock, its environmental sustainability (e.g. related to energy and water) and affordability. The challenges are for both new and existing housing. Beacon Pathway Research Consortium (hereafter referred to as Beacon) identified issues related to NZ housing and its sustainability performance and created a partnership and a 6-year consortium proposal involving research, development and dissemination directed towards sector transformation. The proposal was successful in receiving \$6.75 million in funding from the Foundation for Research, Science and Technology (Foundation), matched by the consortium, commencing in July 2004 and ending on 30 June 2010. This Review has been commissioned by the Foundation to gain an independent assessment of Beacon's achievements and delivery of outcomes related to the Contract's objectives.

Achievements

The mid-term re-focusing of Beacon's programme, reflected in the 2008 contract variation and its milestones, outputs and outcomes, has had, despite loss of time and resources, a very positive effect on the ability of the consortium to ultimately deliver on its Contract objectives. Beacon's two aspirational goals were important in setting over-the-horizon sights for the consortium:

- *"To bring 90% of NZ houses to a high standard of sustainability by 2012"*
- *"To ensure that existing or redevelopment subdivisions from 2008 onwards, is executed with reference to a nationally recognized sustainability framework"*

While still some distance from achieving these goals Beacon has been instrumental in moving the housing sector forward. Key outcomes have included: a clear strategy and framework that all parties could align with ('Beacon on a page'); a 'whole of house' focus; a decision for priority focus on articulating a High Sustainability Strategy (HSS®) for housing; an evidence-based focus; a focus on increasing the performance of existing as well as new housing; investment and management strategies aligned to the six key objectives; and formation of highly effective management and research teams.

The outcomes have been significant. They are catalogued in the three key reports prepared by Beacon for the review panel, as well as having being discussed with and demonstrated to the Panel. They are also represented in the comments provided by Beacon's shareholders and stakeholders during an open forum on 4 May. Sections A and B of this Report contain the Review Panel's assessment of these outputs and outcomes. What follows is a high-level perspective on these achievements:

- Developing a successful partnership model involving research, industry and government

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- Establishing a ‘whole of house’ focus, plus linked key performance domains (energy, water, materials, indoor environment quality (IEQ)) capable of underpinning a National Value Case for retrofitting NZ housing to achieve a high level of comfort and sustainability
- Deciding to monitor as well as model, thereby creating unique databases capable of supporting evidence-based approaches to creation of performance benchmarks for housing
- Demonstrations of best practice for new housing (NOW Home®) as well as for retrofitting housing; supporting the creation of an evidence base for policy (government) and investment (industry, consumers)
- Creating IP in the form of the HSS® benchmarks and prototype computer tools that utilise this and other information assembled by the research teams (e.g. Retrofit Assessor and Plan Builder, Neighbourhood Sustainability Framework, NSF)
- Establishing a consortium (Beacon, BRANZ, NZGBC) to develop a national Residential Rating Tool to drive performance improvements in the housing sector
- Encouraging commercial products via Beacon’s industry partners (e.g. Fletcher Home&dry and new products for retrofitting windows).

It was apparent from the Review that ‘sustainable homes’ would not be as high on the agenda of the NZ government, industry and consumers – as demonstrated by level of buy-in across the sector from key stakeholders – without Beacon.

Learnings

After six years of operation, Beacon is now well positioned organisationally (e.g. key personnel, management and QA processes, governance, networks etc) to capitalise on the initial investment and proceed to the ‘next steps’.

Significant time and resources have been lost in two key areas associated with the Beacon Consortium:

- The first surrounded the time that elapsed while the shareholders wrestled with the focus for Beacon: whether to be predominantly technology-centred and commercially driven (i.e. seeking to maximise development and capture of IP), versus public good; what were to be the key domains for research and the level of investment to be directed at each. The results of this were a revisiting of original programmes and objectives and a subsequent (positive) refocusing around ‘whole of house’ sustainability – the object of Beacon’s #1 aspirational goal; but less certainty around the role of neighbourhood research – the objective of Beacon’s #2 aspirational goal – and a diminution of focus around materials research.
- The second surrounded the fact that best practice management processes were not immediately available for implementation when Beacon was established.

Both constitute areas where the Foundation could be proactive with newly formed consortia.

As Beacon considers its next phase of operation, issues surrounding focus and partners will clearly loom large. Assuming that focus will continue to be on the housing/built environment, key partners additional to Beacon V1 should be sought from the property development industry, finance and investment, the design professions and urban utilities.

Reference in the Review was also made to need for greater scientific peer review of research proposals and results. Addressing this could provide the basis for significantly increasing levels of low cost engagement with leading academic researchers (either restricted to those roles or engaged more intimately with the research projects).

The Future: Next Steps

The building, construction and property sectors are among the least research intensive of any sector in the economy, having a relatively low investment in R&D and compared to other industry sectors have a relatively low level of receptivity to innovation. Yet the benefits capable of being generated from this industry as a result of increased innovation and productivity are considerable, both to the economy (percentage increase in GDP) and the population (refer to Beacon's value cases).

While an assessment of possible future research was not part of the terms of reference for this Review, a number of comments are provided as to possible next steps for Beacon V2 (B2):

- Specification of the scientific research required to underpin the key objectives of B2 would appear to be essential to ensure that transformational objectives have prospect of achievement, and that the Foundation's charter of fostering world class research capable of generating significant benefits to NZ is realised.
- *Research gaps* will emerge from the more traditional areas of energy, water IEQ and materials, but new research arenas will need to be engaged if B2 aspires to objectives requiring Research, Development, Dissemination *and* Transition.
- For *Development*, an IT platform related to digital modeling and data interoperability (i.e. for effective access to and integration of multiple databases) would be central to the creation of 21st century performance assessment and rating tools, e.g. the future NZ Residential Rating Tool (see *Technology, Design and Process Innovation in the Built Environment*, Spon Press, 2009); and the Expert Reference Group for the Sustainable Buildings Framework within Department of Environment, Water Heritage and the Arts and the Built Environment Digital Modelling Working Group in the Department of Innovation, Industry, Science and Research; local expert A/Prof. Robert Amor at University of Auckland).
- For *Dissemination*, new media (including social media and information sharing platforms such as Web2.0) constitute important research and application foci.
- For *Transition*, there is now a recognised need to move beyond workshops and other forms of institutional and community engagement to the creation of transition arenas capable of scoping, articulating and validating alternative new and more effective processes that can be substituted for those currently seen to be failing (leaders in this field are the Dutch Research Institute for

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Transitions). There are several candidate areas for application of transition management, such as identifying routes for increasing productivity and sustainability within and across the housing, building, property and construction and building materials industries.