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# NEW ZEALAND'S RESEARCH, SCIENCE AND TECHNOLOGY PRIORITIES: FEEDBACK DOCUMENT

SUBMISSION TO THE MINISTRY OF RESEARCH, SCIENCE AND TECHNOLOGY

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## BACKGROUND TO IPENZ

The Institution of Professional Engineers New Zealand (IPENZ) is the lead national professional body representing the engineering profession in New Zealand. It has approximately 11,500 Members, including a cross-section from engineering students, to practising engineers, to senior Members in positions of responsibility in business. IPENZ is non-aligned and seeks to contribute to the community in matters of national interest giving a learned view on important issues, independent of any commercial interest.

## EXECUTIVE SUMMARY

IPENZ supports the simplified investment structure and the apparent new focus on high-technology industries. It considers that emphasis on high-technology industries has a greater potential for shifting New Zealand to a new economy than the other platforms.

IPENZ recommends that a simple test be used to compare potential research and thus inform the shift of funding across outcome categories, or within groups of categories. It believes that the test should consider likely value of return, transformational change, opportunities for co-investment and new economic activity creation.

In relation to the biological economy fund, IPENZ considers there are too many potential platforms and suggests changes to the platforms.

IPENZ recommends changes to the basic research system. IPENZ notes that basic research in engineering and other professional disciplines cannot be judged against the same criteria as basic research in science, and to attempt to do so would put engineering and the other professional disciplines at a disadvantage, to the national detriment.

IPENZ recommends that the proposed Top Talent fellowship scheme be changed to ensure there are market rate stipends in each discipline to encourage research where it is most needed.

Finally, IPENZ notes that the *CRI Capability Fund* should only be needed in the short term. Once programme funding in outcome areas achieves outcomes like maximising

co-investment and personnel transfer in the high-technology outcome category IPENZ considers that this fund will no longer be required.

## **SUBMISSION**

This submission provides comments on each of the areas listed on the “How can you contribute” page in the feedback document.

## **THE OVERALL INVESTMENT STRUCTURE**

IPENZ supports the simplified investment structure presented on page 7 of the feedback document, which is consistent with simplification IPENZ has advocated in previous submissions to MoRST. IPENZ considers that the structure will allow for greater clarity around the extent of investment to address New Zealand’s health, environmental, economic security and economic development needs.

IPENZ supports the focus on high-technology industries. IPENZ considers that high-tech industries will help to shift New Zealand to a new economy more than any of the other platforms. However, it is important that “high-tech industries” is clearly defined. IPENZ considers that high-tech industries are those:

- in which the competitive advantage comes from New Zealand intellectual capital, and which industry is not reliant on a New Zealand raw material, and
- this intellectual capital allows the development of internationally competitive manufacturing or service industries typically producing high-value, low-volume products or high-value technical services
- disruptive or breakthrough process technology that enables a step change in the production means for an existing product is not necessarily excluded.

IPENZ does not consider that ongoing process improvements can be considered part of high-tech industries, no matter how sophisticated the process is. It is important that the definition and therefore the platform include the development of services. IPENZ therefore recommends that the priority areas and potential platform be reworded to include services.

## **THE CURRENT WEIGHTING OF FUNDS WITHIN THAT STRUCTURE**

IPENZ notes that funding levels presented on pages 10–12 seems to do little more than re-categorise the funding around the new investment structure, without actually shifting investment between outcome categories. Although this is a useful first step, IPENZ is concerned that the process does not stop there. If it did, the funding allocation would continue to follow historical patterns, rather than be suited to creating the future mix of economic development opportunities that New Zealand needs.

## **WHERE THE EMPHASIS SHOULD SHIFT, GIVEN THE GOVERNMENT’S GOALS**

In simple terms, funding changes should be applied where the greatest value is obtained. This can be construed as a simple test – what is the relative value of adding \$1 million or taking off \$1 million from any outcome category?

The test could be used to compare potential research and thus inform the shift of funding across outcome categories, or within groups of categories, for example, high technology, biological economy and energy and minerals might be treated as a sub-group in this respect.

Such a funding test between the latter three categories needs to consider the following:

- **Likely value of return.** Given the principle that the public R&D system should “invest where research can advance New Zealand’s economic performance, productivity and future development”, IPENZ considers it important that research funding is shifted according to research’s likely value of return. This test should not relate to industry size (the old argument that a small per cent shift in a big number is better than a large per cent shift in a small number – small industries will be held back if that argument was applied, yet they could potentially be the big industries of the future.)

(A significant portion of R&D investment is spent in non-economic areas such as the maintenance of the environment. Investment decisions in relation to this research could be made based on non-economic “likely value of return” tests.)

- **Transformational change.** It is also vital that research is focused on areas where transformational changes are possible, rather than incremental changes.
- **Co-investment.** Linked with the first bullet point, the ability for research to draw in private sector co-investors is important as it leverages funds and shows industry commitment to an R&D programme. Co-investment should therefore be a factor in determining the allocation.

However, care needs to be taken to ensure that small industries that cannot afford to make substantial investments do not miss out on funding. If this occurred then a bias would be created that would discourage transformational change and result in incremental research for large industries.

- **Ability to create new economic activity (rather than enhance existing activity).** IPENZ considers that New Zealand needs to shift to a new economy, rather than focusing only on the things that we have traditionally done well. This may mean developing new activities or building off existing industries to be transformational.

IPENZ considers that if this test is applied, it will favour increased investment in developing of high-tech companies, which in turn will result in morphed old companies and some new companies that employ a highly skilled workforce and which place less reliance on New Zealand’s raw materials. These companies will be based on world-leading intellectual capital and provide New Zealand with greater ability to diversify its economy.

#### **WHETHER THE PROPOSED STRUCTURE IS FLEXIBLE ENOUGH TO RESPOND TO NEW OPPORTUNITIES AND CHALLENGES AS THEY ARISE**

To apply the test above, IPENZ considers that the following mechanism would increase flexibility in the proposed structure:

- A system of removing five to 10 per cent of the allocation of funding in each outcome category every three years and placing this in a reallocation pool. After applying the test above, these funds could then be reallocated to outcome categories. IPENZ considers that this stripping and reallocation should not be done any more frequently than three-yearly due to the need at a practical level to not compromise long-term contracts for research programmes.

The proposed form of the test and reallocation mechanism would encourage research providers who are dependent on major funding from one of the outcome streams to implement strategies that demonstrate their research is achieving the outcomes.

It must also be recognised that different means are needed to allocate funds within categories. Although this is outside the scope of this paper, IPENZ considers it important to note that funding decisions within different outcome areas and within categories need different methods of allocating funding. For example, basic research favours project funding, environmental research programme funding, and high-technology industries

bulk-funding against outcome-based key performance indicators such as extent of co-investment and personnel transfer.

### WHETHER THE IDENTIFIED AREAS ARE OF GREATEST PRIORITY FOR INVESTMENT IN STRATEGIC RESEARCH PLATFORMS

In relation to the biological economy fund, IPENZ considers there are too many potential platforms, which risks developing many, small projects with reduced synergy. The table below presents our recommendations on the platforms.

IPENZ-recommended priority areas for investing in potential platforms	IPENZ-recommended platforms
Increase pastoral productivity in an environmentally sustainable manner.	Pastoral productivity.
Increase animal and aquaculture productivity and improve post-farm gate activities.	Animal and aquaculture productivity.
Protect New Zealand’s biological economy from biosecurity threats by identifying, preventing and mitigating diseases, pests and weeds.	Biosecurity.
Produce high-value foods, beverages, nutraceuticals and other bioproducts.	Advanced functional biological products.
Derive higher value products from wood through improving wood properties, processing technologies and developing alternative uses.	Higher value wood products.

The IPENZ-proposed platforms and priority areas above make the following changes:

- Change the title of the pastoral productivity platform from “farm systems, feed and forage” to be more general.
- Combine animal and aquaculture productivity to reflect the common focus on increasing output from animal tissues. We have also recommended the associated platform be renamed to reflect its changed priority areas.
- Combine production of foods, beverages and other bioproducts, regardless of whether the products are from plant or animal sources. IPENZ also recommends the associated platform be renamed to “advanced functional biological platforms” to reflect that its focus is wider than food.
- Remove the fisheries and aquaculture platform given that a) productivity is included with animal productivity and b) marine ecosystems are a part of the environment platform.

As stated previously, IPENZ supports the energy and minerals fund and the associated potential platform. Also, IPENZ considers that the platforms associated with the environment and hazards and infrastructure funds are appropriate.

IPENZ recommends that the following be principles for the platforms:

- the researcher and the private sector stakeholders with the capability to carry through the research to practical outcomes build meaningful partnerships
- the delivery of transformational outcomes be pursued
- good governance and stewardship be in place to ensure government investment delivers enduring, long-term sustainable and transformational outcomes.

#### **HOW WELL THE PROPOSED STRATEGIC RESEARCH PLATFORMS FIT WITH THE NEW INVESTMENT STRUCTURE**

IPENZ does not foresee any issues that cannot be resolved.

#### **HOW YOU WOULD RANK THE IDENTIFIED AREAS FOR STRATEGIC RESEARCH PLATFORM INVESTMENT AND WHY?**

See IPENZ's response to "Where the Emphasis Should Shift, Given the Government's Goals" above.

#### **OTHER COMMENTS**

In relation to the *Top Talent: Marsden Fund, scholarships and fellowships* on page 15, IPENZ recommends changes in the basic research system. IPENZ has long contended that basic research in engineering and other professional disciplines cannot be judged against the same criteria as basic research in science, and to attempt to do so disadvantages engineering and the other professional disciplines. To illustrate, there are discussions in the Royal Society of New Zealand (RSNZ) about moving to three academies rather than one to recognise research excellence – one in social science and humanities, one in science and mathematics, and one in engineering and technology. Part of the rationale is that engineers and technologists cannot compete equally against the scientists in the present single academy. In contrast, the PBRF shows there are proportionately many more engineers at A level than in the RSNZ academy. There is thus an inadvertent disadvantaging by lumping science and engineering/technology together. Other countries who have grappled with this issue have often found it easiest to distribute the total basic research pool into categories – IPENZ recommends this occurs here, but that the setting of the proportions should be a contestable matter from time to time.

IPENZ also recommends that the proposed Top Talent fellowship scheme be changed. There is a tendency for such schemes to interfere in the natural labour market by the setting of relatively standardised stipends, rather than allowing these to vary according to the market in each discipline. The inevitable consequence is that in the most-needed disciplines (where pay rates are high because of labour shortage) there will be few takers; the stipend will look attractive in those disciplines in over-supply. The consequence is a further boosting of the oversupply (and continuation of undersupply in desperately needed disciplines). The scheme must allow stipends equivalent to labour market rates to encourage candidates in disciplines in short supply such as engineering to apply.

In relation to the *CRI Capability Fund* on page 16, whilst IPENZ supports this fund in the short term, it believes that the need for it to exist is due to poorly designed investment strategies in distributing the other forms of funding. If there were good programme funding (and review mechanisms) in outcome areas such as environment and the biological sector, and single-line funding in the high-technology area to achieve outcomes like maximising co-investment and personnel transfer in the high-technology outcome category, the need for a CRI capability fund would be diminished.

One of the general principles is that the science system will be based on scientific excellence and impact. IPENZ would prefer this was re-stated as “research excellence and impact” which would allow for both valid measures of research quality – peer review and fitness for purpose.

## **CONCLUSION**

IPENZ appreciates the opportunity to make this submission and is able to provide further clarification if required.

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