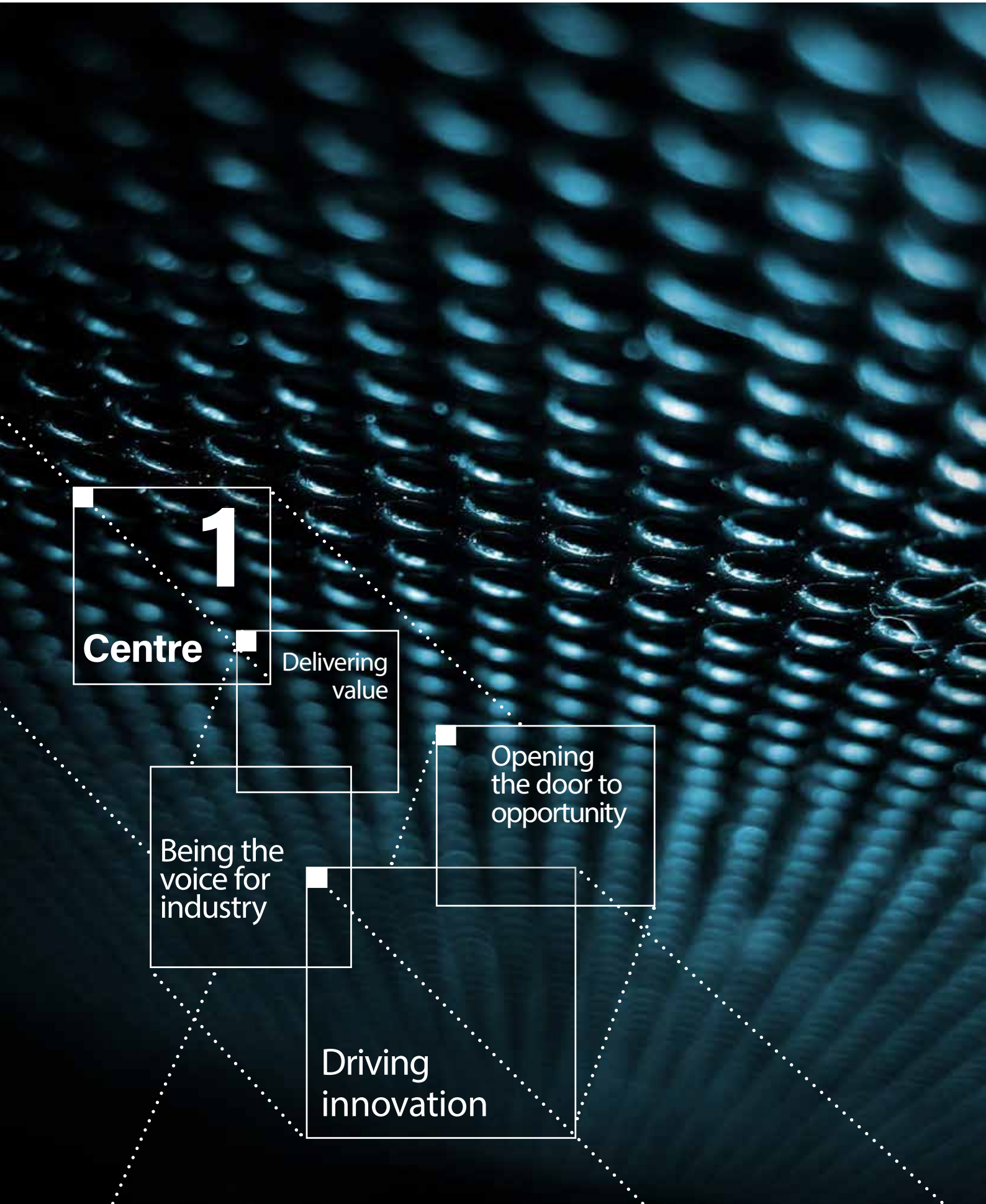
HERA
Innovation in Metals

Annual Report 2016



Serving the New Zealand metal-based industry.

HERA creates value by being the stimulus for research, innovation and development as a trusted national centre for design, manufacturing technology, inspection and quality assurance.

Our commitment to help our members stay one step ahead is strengthened by our vision to be the leading catalyst for metals innovation internationally.

Our specialists in heavy engineering research, industry development, training, advocacy and marketing allow us to partner with our members and clients across the globe – to create opportunity and lead bigger picture thinking.

Industry owned. Member driven. Future focused.

Content

Our people

From left | Structural Systems | Senior Structural Engineer Dr Jing Cao, General Manager Dr Stephen Hicks, Finite Element Analyst Nandor Mago | Welding Centre | NDT/Inspection Specialist Peter Hayward, Research Engineer Holger Heinzel, General Manager Dr Michail Karpenko, Senior Welding Engineer Alan McClintock | Administration | Accounts Officer Kam Subramani, Director Dr Wolfgang Scholz | Information Centre | Receptionist Raewyn Porter, Manager Brian Low, Resources and Safety Officer Gillian Casidy | Industry Development | Market Development Coordinator Kim Nugent, General Manager Nick Inskip, Research Engineer Dr Lei Chen, Senior Research Engineer Dr Boaz Habib, Research Engineer Dr Haiam Abbas

Report from Chairman and Director

A successful FY2016 for the metals based industry coupled with a strong levy income has allowed HERA to take important steps to drive growth and respond to changing market conditions to support our industry's long term success and improve member value.

We've realigned our strategic focus to ensure we improve our value offering to members by driving innovation and business opportunities and strengthening our role as the voice of the industry – achieving this through our key offerings in industry development, information resources, structural systems and welding expertise.

Chairman, John Frear | Volkswagen NZ (formerly Best Bars)

Driving innovation

Strengthening our innovation culture remains at our core – as we respond to a market that continues to demand our members rapidly adjust to the dramatic advances in our industries brought about by emerging technologies and shifting business models.

We're pleased to report that we've made significant progress in our key research and development programmes - bringing ingenuity to heat exchange and turbine models to deliver more cost effective, sustainable clean energy technology for niche market export applications. Progress in our Expert Design Tool and Materials and Heat Exchange Test Rigs have also been invaluable as we work to innovate and take our products one step further for our members.

An extensive focus on improving New Zealand standards has seen us advance the evaluation criteria and guidance for steel construction in composite bridges, enabling transport infrastructure networks to safely support heavier vehicles to improve productivity. Harmonisation between Australian and New Zealand standards for the design of steel and composite bridges has not only aligned us to international best practices, but armed our members with the ability to push boundaries and deliver more cost effective solutions to their clients.

Ongoing efforts to improve steel construction design and productivity to meet seismic conditions continue to drive our welding research - with progressive welding trials and testing underway. Early indications suggest significant optimisation of our member's fabrication and inspection obligations can be expected through our research findings, which combined with our work to innovate in FEA modelling and testing for seismic connections could truly influence our member's ability to win work in a highly competitive market.

However a volatile funding environment has restricted our ability to continue meeting these expectations as the governments R&D co-funding programmes have progressively become more limited and increasingly competitive.
An over subscription and subsequent suspension of the existing MBIE Research Partnership funding forced us to unsuccessfully seek alternative funding models for our largest joint research programme AGGAT, and as a result, we've now taken drastic steps to approve an internal financial spend to retain established research capability until FY2017 funding rounds restart and a programme extension can be achieved.

Going forward its clear, apart from government R&D co-funding, industry ownership and engagement will be key if we're to continue delivering value in this research space.

Director, Dr Wolfgang Scholz | HERA

Opening the door to opportunity

Delivering to our member's expectations is vital to our success – and having overcome the funding constraints of the past years, we've now taken steps to foster our in-house expertise in marketing and communications, appointing Market Development Coordinator Kim Nugent to achieve this.

Tasked with recognising market needs that can be linked to scientific research to create targeted business development initiatives - a current focus on ocean engineering technology development is being explored and has already connected strong expertise within our industry to innovate thinking and potential end users in aquaculture applications. Early indications show this could lead to multiple market entry points through niche offerings – placing great weight on us to capture member capability through a proven track record in the marine industry over the coming months.

FY2016 has also seen us continue to strengthen our local steel construction industry in their effort to deliver steel's demanding specifications, as we position to compete successfully against international markets. Working collaboratively with SCNZ, we've developed the Steel Fabrication Certification (SFC) scheme – representing around 75% of New Zealand's steel fabrication capability, with 21 companies now HERA certified. This industry commitment has created a positive cultural shift within our industry to drive quality and workforce upskilling to meet international best practice standards. Moving forward, ensuring this scheme is a mandatory requirement for all critical national steel construction projects is something we'll hope to achieve as we look to grow our relevance locally and abroad.

Delivering value

We continue to operate in a rapidly changing and competitive environment, and ensuring we stay relevant as an organisation has seen us re-look our approach and the way we interact and support our members. We've proactively taken steps to create a stronger structure, more targeted communication strategy and an evolution of our branding in a bid to modernise our offerings, digital presence and key relationships. The uptake of a fresher and more genuine HERA will be a guiding hand as we look to take the next steps in our digital transformation to create a more user friendly website and management resource that allow members to keep their finger on the industry pulse.

On the ground, we recognise that many of our partnership organisations and members are doing great work in their respective sectors that ultimately work to benefit our industry – and ensuring we support them is crucial as we work to keep communication and collaboration lines open.

FY2016 has seen us actively participate and offer administrative aid to the Metals NZ Industry Conference – an important industry and business networking forum and advocacy hub for our members, along with recognising industry excellence through the HERA Awards programme in conjunction with our charitable trust HEERF.

Being the voice for our industry

FY2016 saw us continue our commitment to lead the charge for policy change that benefit our members – and naturally has seen tension arise as we work to deliver member value under the governance of our Levy Act which holds us accountable as a research association committed to R&D versus an industry driven advocacy body.

In response we actively continue to formulate policy and have created strong ties with Metals NZ, SCNZ, NASH, NZSSDA, COMPETENZ and university research partners to fill the gaps outside of our research parameters - ensuring our members always have support, no matter what part of the journey they're on.

Rising quality assurance issues around imported steel supply in the media have painted our heavy engineering industry in a bad light – despite reported incidents falling outside of our scope. Acknowledging the public is unable to distinguish the difference between the various steel applications, we've taken steps to consult with all involved to take the stance that all critical building work independent of material should be third party verified – a policy the SFC scheme is introducing to lead industry and ensure our perspective is clear.

We recognise Government and Public Sector procurement changes have an immense potential to advance our industry - and while the New Zealand World Trade Organisation (WTO) aligned Government Procurement Agreement (GPA) Rules provide an adequate framework, a lack of cooperation and compliance has worked against our members bidding in these environments.

As a result, we've refocused our research to better understand what other WTO GPA nations are doing in this space, commissioning BERL to provide international comparison on procurement practices as we look to inform improvements as part of our commitment to stabilise future pipeline opportunities.

Acknowledging safety

Given the challenges our industry and members undertake for their clients – ensuring we have a safe working environment is of vital importance.

Recent implementation of new legislative requirements in workplace health and safety have given us a fresh perspective on our own internal approach and we're pleased to report we're taking action - as we move to lead our industry in the thought process of placing safety at the core of everything they do.

We've initiated regular safety shares, upgraded signage and reporting mechanisms for near misses and incidents – and more critically implemented this into our member training activities for welding applications.

Financial performance

Our underlying income was $3.8m compared to $3.3m for FY2015, and this was combined with a surplus of $0.56m due to a stronger performance of the metals industry and our resulting levy income and restrained spending due to a lack of resources.

This surplus is welcomed, as we position to execute future activities that work towards a more sustainable metals based industry and future proof against the inevitable ups and downs of economic cycles.

Our future outlook

While the steel construction demand forecast looks stable until at least FY2019, increased pressure from fabricated steel imports will push us to improve our competitive positioning - especially in productivity and quality assurance.

In FY2017, we'll be focused on the development of a formal steel construction research roadmap and business model analysis aimed at identifying alternative delivery models, and combining industry capability to export into steel construction niches.

Our Executive Board

Paul Bryant
Steel & Tube

Thomas Neitzert
AUT University

Pragya Sharma
Advanced Boiler Services

Peter Hutton
Fitzroy Engineering

Mike Lehan, Deputy Chair
Page & MacRae

Dr Troy Coyle
New Zealand Steel

In the less buoyant and much more diverse general heavy engineering industry sector, driving IP development and a transition from contracting based work to manufacturing will be key in creating industry opportunities - especially in the AGGAT and the newly established sustainable marine sector. As we work to showcase member capability, attract government co-funding, industry commitment and international uptake, it's clear we'll need a major strategy review to achieve our commitments going forward.

In response to future capability and skill needs we'll move to increase our focus on leadership training, and as part of our commitment to build an end-to-end digital model that connects our data and expertise to our members, we're excited to implement website and membership management upgrades later this year.

Our people

HERA is an organisation that wears many hats and as such relies on the input of many – and we'd like to thank all of those who've played a part in keeping us relevant and forward focused throughout the year.

It has to be said, that within HERA our strength certainly lies in our staff and Executive Board, and the expertise and support they deliver to our members.

We look forward to their continued drive and commitment as we move to explore new opportunities in FY2017.

In reflection

We'd also like to give special acknowledgement to our former Director Gavin Fletcher, who sadly passed away last August.

He was instrumental in the inception of HERA as a successful research association and the brilliantly refurbished HERA House is a constant reminder of his legacy, as is his Toki Poutangata he left behind which sits on every director's desk as a symbol of leadership - reading **"May HERA Always Lead."**

John Frear
Chairman

Wolfgang Scholz
Director

Former Director, Gavin Fletcher
4 January 1941 - 30 August 2015

John Frear, Chairman
Volkswagen NZ

Chris Burns
SCNZ

David Moore
Grayson Engineering Ltd

Bruce Bonner
IMG

Noel Davies
Hydraulink Fluid Connectors | HEERF Chairman

Craig Stevensons
Aurecon

Simon Ward
A-Ward Attachments | NZMEA

Our industry in numbers

The 2016 Financial Year was an encouraging one for the metals-based industry, fuelled by an exceptional demand in steel construction in response to rebuild and immigration pressures.

We've taken great strides to drive innovation, but now more than ever - must respond to emerging import and export trends as they look to influence our future outlook.

This year, our reported New Zealand steel consumption subject to the heavy engineering research levy was 170,697 tonnes, exceeding FY2015 with a total annual growth of 8.4%. This reflects a healthy industry responding well to strong market conditions, and returns us to our previous high of FY2008 pre the Global Financial Crisis.

Our industry has been bolstered by steel construction demand, which has successfully increased order books particularly in response to the Canterbury rebuild and Auckland housing crisis.

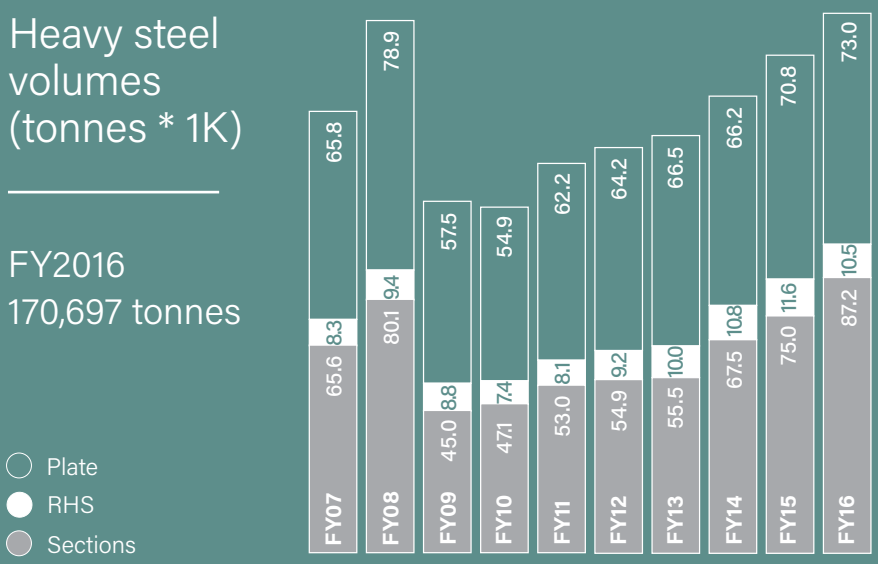
Long term sustainability of this upward trend remains a concern as heavy fabrication related imports and diminishing exports continue to challenge our forward pipeline. Since FY2015, annual imports for the New Zealand Heavy Engineering Imports/ Export Collective have grown close to 9%, yet exports have also dropped 9%, widening our annual trade balance gap by a staggering 18% - demonstrating we've certainly missed local manufacturing opportunities, and left it for international suppliers to fill.

A similar trend for the sub-tariff item of welded fabricated steel is also seen, with FY2016 delivering a 9% import value increase to $171m, however export numbers remained steady. Assuming an average cost of $3,000 per tonne, total annual imports equate to 57,000 tonnes, with an annual increase compared to last year of 5,000 tonnes.

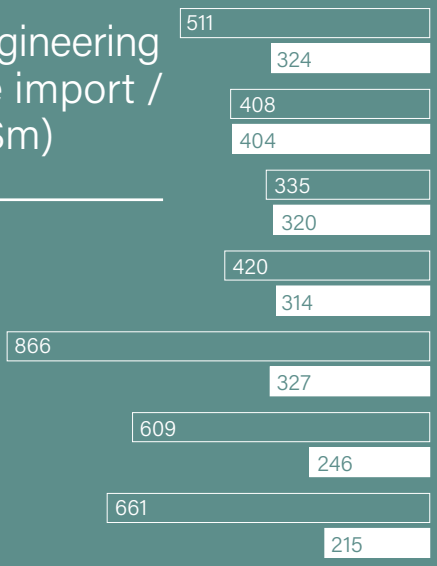
Strong discipline across our wide operational member base has allowed us to absorb a range of industry challenges – a reflection of the resilience and hard work we've put in over the past eight years to return to a stronger position. However with long-term industry sustainability in mind repositioning our business strategies to respond to changing market conditions are key if we're to match or improve on our figures in FY2017 - we need to do more to drive our international competitiveness as this will not only assist us in being successful against imports, but allow us to access niche export opportunities.

Heavy steel volumes (tonnes * 1K)

FY2016
170,697 tonnes



Heavy engineering collective import / export ($m)



HERA in numbers

Our main income streams come from our industry funded heavy engineering research levy, government research contracts and self-generated income from consulting, training, certification, examination services and membership fees.

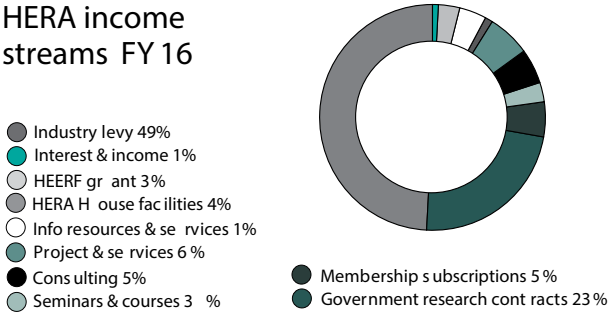
In FY2016 the industry levy of close to 50% made up the largest contribution, with government co-funding accounting for 23% and self-generated income for 27%.

This year's income topped $3.8m with a 14% increase in income over the last year - steady income growth that is testament of the industry's presence and engagement with us as their research and industry association.

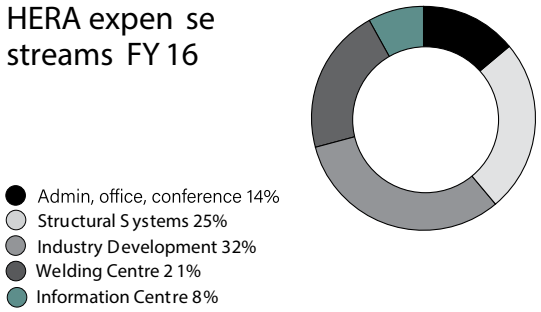
Our divisional expenses were spread evenly across research and development programmes with Structural Systems accounting for 25%, Industry Development 32% and our Welding Centre 21%. Support services for administration and HERA House sat at 14% of expenses, with our Information Centre taking the remainder of the $3.2m expenses at 8%.

HERA membership at the end of year stood at 613, distributed between fee paying Ordinary and Affiliate and the free membership category of "levied materials using" Associate. Compared to last year, membership subscriptions have risen by just over $5,000 to $172,000, representing 5% of our income and demonstrating the value members see in being part of our association.

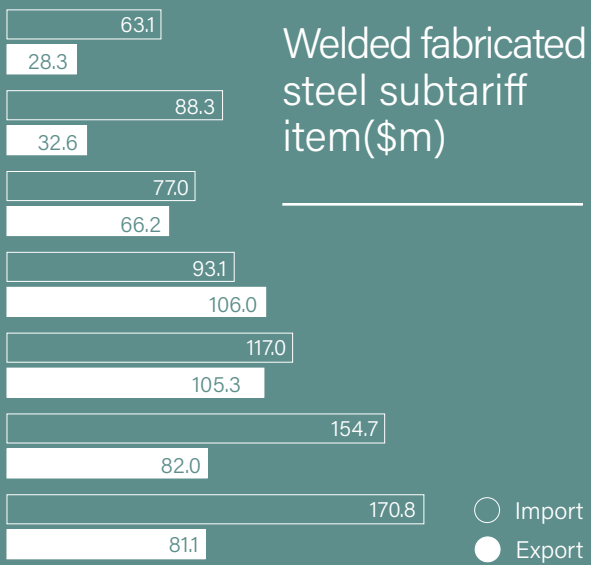
HERA income streams FY 16



HERA expen se streams FY 16

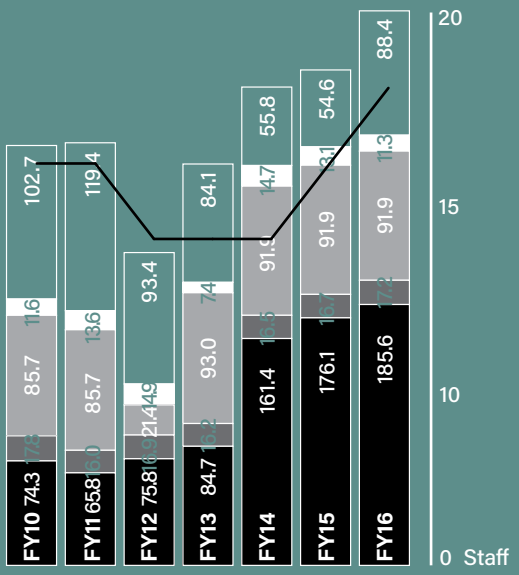


Welded fabricated steel subtariff item($m)



HERA income streams ($K) & staff numbers

FY2016
$3,945,801 / 18 staff



Research & development

We're able to deliver value through income generated from several sources – but of most significance is the industry contribution we receive through the Heavy Engineering Research Levy Act which governs us to drive innovation through research and development as our organisations core focus.

We're happy to report that we've seen significant progress in our drive for innovation through our FY2016 R&D programmes as we work to create clear pathways to business opportunities for our members.

Industry Development

A streamlined and more technically sound in-house capability has seen our team capitalise on new opportunities in the clean energy and marine space – improving our member focus and supporting a responsive market driven R&D approach.

Above Ground Geothermal and Allied Technologies (AGGAT) programme

In our pursuit to develop clean energy technology utilising geothermal and waste heat resources we're working with our partners such as the University of Auckland to drive Organic Rankine Cycle (ORC) advancements to convert this energy into affordable and usable power.

Expert Design Tool (EDT)

The development of this innovative tool led by Dr. Boaz Habib from HERA in collaboration with Dr. Wei Yu at the University of Auckland was built to support our members in assessing prospective heat resources in their Organic Rankine Cycle (ORC) technology. This has avoided the need for them to engage with multiple experts - a move that substantially cuts early development costs and provides a clear 'start point' to advance technology from.

Heat exchangers

Our research engineer Dr. Haiam Abbas was awarded the best paper prize for addressing industrial challenges through fundamental engineering research in heat exchangers at the 2015 NZ Geothermal Workshop. HERA is collaborating with Professor Mohammed Farid at the University of Auckland, Heat Transfer Research Leader to create a smaller technology footprint – significantly reducing manufacturing costs and placing members in a stronger and more competitive position with a cost effective technology solution - particularly where space is an issue.

Turbine

Our aim to deliver New Zealand's first purpose built high speed, high efficiency radial inflow turbine is on target for completion in FY2017 with Dr Lei Chen, Turbine Research Engineer having now finalised designs for our turbine. Incorporating a unique scalloped rotor and balance piston design approach in alliance with international magnetic bearings company S2M-SKF, we've created a pathway of scale up for turbine power over the next few years - driving business opportunities for participating members through the AGGAT programme.

Materials test rig

To understand the application of materials in a geothermal environment, our Welding Research Engineer Holger Heinzel completed a multi-tube test heat exchanger with member Initiative Engineering for incorporation into the Ohaaki test rig – allowing us to inform on material and coatings that better optimise member ORC designs.

Control systems

Under the guidance of Professor Brent Young at the University of Auckland, we now have steady state and dynamic control system models developed for ORC plants verified with real data from Ngawha geothermal binary plant. This has allowed us to independently test ORC plants for control performance giving us more independence in our design.

AGGAT

With HERA's support our AGGAT JV partners:

Advance Boiler Services

Are currently refining their waste heat ORC plant for testing

PFS Engineering

Are close to starting their 200 hour trial run for their geothermal ORC plant before moving to a live geothermal test site.

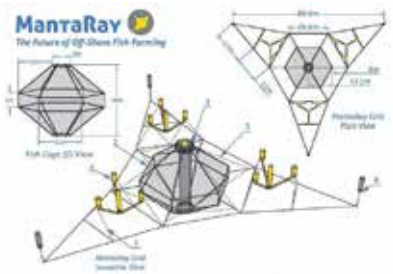
Our first AGGAT test rig for heat exchangers and turbines will be the first to be built in New Zealand and is close to starting trials.

Ocean engineering

Capturing the power of waves and tides to convert into clean, pollution free electricity and advancing marine infrastructure could greatly influence how we interact with this environment.

As a result, we continue to drive innovation in this space, actively engaging with the Aotearoa Wave and Tidal Energy Association with General Manager Industry Development Nick Inskip sitting on their Board.

A significant focus on supporting our members in the development and fabrication of innovative, proven and cost effective marine technology has resulted in an emerging research project to develop a marine powered offshore fish farm with leading fin fish companies in New Zealand – we certainly look forward to discovering smarter solutions in this space going into FY2017.



| Top | Nick Inskip on Sanford salmon harvesting barge, Stewart Island | Bottom | Mantaray offshore wave and tidal fish farm concept by Albatern Wave Energy, Scotland

Evaluation of sheer connectors in existing composite bridges

We've carried out extensive work on behalf of NZTA, in conjunction with member Opus to develop evaluation criteria and guidance to assess the maximum load carrying capacity of existing composite bridges.

Through our bridge surveys, we've identified the most widely used shear connector types and their geometries, allowing us to conduct structural reliability analyses on the innovative design provisions - this will open up the existing highway network to heavier 50MAX and high productivity motor vehicles, whilst still delivering the required safety margins.

As well as steel's well known recycling attributes when considering sustainability, this work will also open the door for reuse and reclassification of existing composite bridges - as opposed to existing solutions with competitor materials that would require strengthening or replacement.

124+ bridges surveyed nationwide

Structural Systems

This year we've committed our research and development focus to driving advancements in both product and design standards for steel and composite buildings and bridges - helping our members to deliver smarter solutions.

Improving steel and composite construction standards

Our General Managers Dr Stephen Hicks and Dr Michail Karpenko, this year collaboratively achieved their first harmonised standard between Australia and New Zealand - AS/NZS 5100.6 steel and composite construction.

| Top | Middle | Loaded fire test at BRANZ on light steel framed floor | Bottom | Research on the reliability of fabricated steelwork

This means we're in a position to better align with international best practice and work opportunities, and significantly improve composite and fatigue design as we seek to drive ingenuity in steel construction.

We've successfully adapted the Eurocode damage equivalent factor design methodology - a simpler and more user friendly approach that provides certainty in fatigue design. This reduces the need for conservative engineering and welding detail - to deliver project cost savings for members.

A global oversupply of steel has seen overseas products more frequently specified, creating uncertainty in how users can demonstrate conformance. We've responded by collaborating with Professor Brian Uy and Dr Won Hee Kang to develop an appendix specifying minimum workmanship standards required to ensure design assumptions remain valid.

The introduction of high strength concrete and steel has also meant that the current international design provisions for composite construction are no longer applicable, which is why we've carried out rigorous structural reliability analysis to create new design rules to cover these high strength materials.

Leveraging the renowned specialist expertise of Prof. Adolf Hobbacher, we've also introduced reliability differentiation for safety factors - used typical worked examples extended through parametric analyses to consider differing bridge spans, as we work to deliver economic and safer structures to our communities.

Project

Design work for multistorey light steel frame buildings

Location

New Zealand

Client

NASH BRANZ

In response to the Auckland Unitary Plan encouraging greater urban intensification through multi-storey residential buildings, HERA created a design guide enabling New Zealand to unlock the benefits of modern methods.

As the mechanical properties of Australasian produced, thin, high strength steel is unique, much of the existing test data from northern hemisphere countries on thicker, lower strength steels is not applicable.

To address this, we used our FEA expertise to develop a numerical model and validate it against a European fire test on a light steel frame floor. From here, we were able to design and optimize the test specimen using New Zealand Steel materials which was later fabricated and subjected to a loaded fire test at BRANZ.

Uncertain that existing stud-to-bottom plate and bracing details would still be appropriate for multi-storey applications, we evaluated the actions by lateral loading an exemplar 6-storey building in Auckland, with the University of Auckland undertaking full-scale tests to develop an optimized solution.

New standards created:
AS/NZS 1252.1
AS/NZS 1252.2
AS/NZS 5100.6

New standards published:
AS/NZS 1163
AS/NZS 3678
AS/NZS 3679.1
AS/NZS 3679.2
SA TS 102

Seismic research

Today, the Canterbury Earthquake Sequence in 2010/2011 still continues to affect not only the local region, but the country as a whole as we look to future proof our welded steel structures against seismic events.

That's why our on-going seismic research program is a focus as we seek to better understand where we can deliver value through time and cost savings to our members by optimising the current standard's requirements. So far, we've carried out welding trials on hot rolled sections involving NDT and mechanical testing – which is expected to result in optimisation of fabrication and inspection requirements for welding hot rolled products.

We're also collaborating with the University of Auckland and global partners to carry out advanced FEA modelling and large scale seismic tests to optimise weld details for seismic connections. We know our members look to deliver cost effective solutions to their clients – and we've responded by delivering research that helps them to confidently select the best performing, and most cost effective weld solution in critical seismic connections.

Non-destructive testing

Inspection and testing is an integral part of the fabrication process to meet the New Zealand structural steel design and fabrication standards.

While the new DR AS/NZS 5131 Structural steelwork / Fabrication and erection standard introduces the concept of 'construction category' to link the importance level of a structure and provide minimum levels of workmanship to ensure design assumptions remain valid – the inspection requirements have yet to be linked to reliability classes.

Similarly, the construction categories of DR AS/NZS 5131 which are related to the welding quality management system ISO 3834 fail to take into account fabricator quality management efforts. International best practice shows fabricators maintaining a system to ISO 3834 Part 2 achieve consistent results in terms of the quality of fabricated products, which our current inspection requirements don't allow for.

Our Structural Systems and Welding Centre have combined expertise with Western Sydney University Dr Won Hee Kang and University of New South Wales Brian Uy to conduct research at SFC certified fabricators – with a focus to identify defect levels, understand key impact factors affecting quality of welding and evaluate the effectiveness of inspection techniques used.

As a result, we've developed a comprehensive data base across seven companies and 36 projects including more than 12,000 welds – as we work to develop statistical models to link inspection with reliability levels.

Developing a fabrication and erection of steel standard

Our on-going commitment to ensure welding and fabrication standards reflect best practise has seen the development of the new Standard AS/NZS 5131 Fabrication and Erection of Steel - now in draft form for public comment, this should be available for member use in the next year.

This standard will be critical for our SFC Scheme - allowing us to keep our members up to date with technological advances and quality requirements in the market, as we work to give them a competitive edge against increasing import numbers and the globalisation of construction product sourcing and changes in procurement practices that raise the risk of non-compliance.

NZ Welding Centre

Our FY2016 focus has been to drive innovation and help our members meet international best practice in welding quality management systems.

| Top | Alan McClintock working on 'k-area project' - welded hot rolled sections | Bottom | Research done at SFC certified fabricator D&H to identify key impact factors affecting quality welds

| 1 | BDS Vircon - responsible for the design and construction of Sun Trust Park Project in Atlanta USA | 2 | Fitzroy Engineering - fabricated underwater restaurant for H
Mills building, Newmarket | 5 | His Excellency Rodney Harris, NZ Ambasssador to Germany & Dr Wolfgang Scholz HERA - New Zealand German Business Association An
9 | Eastbridge - platform & boat | 10 | HERA/SCNZ - five fabricators join the ranks of the SFC Scheme at SCNZ anniversary celebration in Queenstown | 11 | HERA - Dr Ha
Welding Inspector course | 14 | NZ Steel - IIW visitor tour of NZ Steel Glenbrook Plant | 15 | PFS Engineering - Dr Boaz Habib & Will Taylor with R&D ORC plant technolog
workshop series

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uravahli Island Maldives | 3 | Chapman Engineering - building components fabricated to latest seismic standards in Christchurch | 4 | Hawkins - Les
mbassador Lunch | 6 | Eastbridge - Wainui pedestrian bridge | 7 | HERA - Rod Oram presenting at Metals Week | 8 | Hawkins - Kaiapoi Library |
iam Abbas with her NZ Geothermal Conference award | 12 | Waikato Steel Fabricators - Tokoroa Freight Hub | 13 | HERA - attendees of the 2016
gy | 16 | Unitec - Vertex virtual welder exhibit | 17 | HERA - Professor Adolf Hobbacher with Dr Michail Karpenko presenting at the Welded Connections

Consultancy

Our specialist in-house expertise in design and construction and finite element analysis give us the unique ability to deliver innovative solutions to project challenges – finding answers to problems, when no one else can.

We're proud of the consultancy work we've delivered in FY2016 - working on a wide range of projects both nationally and abroad in a bid to better inform our clients and deliver them value through our scientific research.

Project

CapitaGreen

Location

Singapore

Client

HERA successfully carried out numerical simulations to estimate fire performance of a composite slab with a re-entrant profiled steel sheet for the prestigious 40 storey CapitaGreen Project – delivering NZD$182,000 cost savings to our client M Metal Pte Ltd.

Numerical predictions were verified through a full-scale loaded fire test conducted in the UK to obtain a international standard fire rating. This work allowed us to optimize the design of the composite slab - eliminating unnecessary reinforcement bars generally required to achieve the target fire resistance rating (FRR).

FY2016 in a snapshot

We've carried out:

6

consultancy, design guide and product development projects

Delivering innovation to clients across New Zealand, Singapore and Australia

Dr Stephen Hicks, Prof. Brian Uy of UNSW & Alastair Soane of Structural Safety UK in Geneva discussing the establishment of an Australasian CROSS

Education & qualifications

Keeping our existing workforce at the forefront of technology continues to drive us - which is why we've focused on providing our industry with a valuable pathway toward career advancement.

We continue to offer a wide range of industry training and professional development courses in reaction to a competitive market that demands our members have the expertise and capability to meet client expectations.

3 workshops run

- 40 people attended our AceCAD sponsored Productivity Technology workshop on global leading software solutions for NZ SFC Scheme
- Our Profitability in Steel Workshop gave our members valuable insight into new technology
- Offshore wave energy powered fish farm workshop

8 presentations given

- 80+ IPENZ members at 'Current best practise in managing the quality of welding' presentation
- 150+ people at 'Load assessment of composite bridges'
- 100 people at 'AS/NZS2327 New standard for composite steel concrete buildings
- Southmach 2015
- EMEX 2016

8 courses delivered

- Welding Supervisor AS2214 & International Welding Inspector courses for professional development has had over 200 people take the course, 58 people in 2015 alone

5 conferences

- NZ Bridge Summit 2015, Auckland
- Metals Conference 2015 - Steel Innovations | HERA stream
- IABSE Conference 2015, Switzerland facilitator on international design challenges
- 10th Pacific Earthquake Engineering - chair
- AWATEA Marine Energy Conference 2016

Chairman's report HERA ANB

To maintain a competitive edge, our New Zealand industry requires a tertiary educated skilled work force and welding coordination and inspection staff that hold the specific technical knowledge not usually available within a standard technical education.
Understanding this unique and very important niche market, the HERA ANB as the International Institute of Welding (IIW) Authorised National Body (ANB) for New Zealand has successfully moved to fill this gap - delivering the examination requirements needed for international and national welding related qualifications.

All of our activities including the examination process, are controlled by an independent ANB Governing Board comprised of representatives of the New Zealand fabrication industry, training providers, universities and other interested parties with a valid interest.

Our welding supervisor and inspection qualification program is central to the Steel Fabricator Certification Scheme (SFC), which is based on IIW's world-class Manufacturer Certification Scheme IIW MCS ISO 3834 which requires certified fabricators to have appropriately qualified staff in place.

In FY2016, we issued:

20
International Welding Inspector qualifications IWI-B diplomas

40
AS 2214 Welding Supervisor qualification certificates

Phil Stacey
Chairman HERA ANB
Fitzroy Engineering

Chairman's report HEERF

HERA's charitable trust has made important steps to drive metal based engineering research and career growth in FY2016 as part of our commitment to long term sustainability for our industry.

Chairman, Noel Davies | Hydraulink Fluid Connectors

Our quest to promote the study and understanding of ferrous and non-ferrous metals in engineering is pursued through the Heavy Engineering Educational and Research Foundation (HEERF).

Our income

Our total income was $281K – obtained through HERA House earnings and an endowment fund created in 2005/06 through donations offered in support of our key objectives.

A significant 33% increase in HERA House rental income off the back of recent refurbishments assists us in recovering our upgrade costs, while at the same maintaining our ability to offer grants at similar levels to previous years.

Our grants

| Post graduate scholarships | Continuing our efforts to drive research and industry development, our contribution was $111,599 for FY2016, offered mainly through HEERF scholarships for HERA's research programs.

Above Ground Geothermal and Allied Technologies (AGGAT) uptake of funds covered three PhD students from the University of Auckland (UoA) and University of Canterbury (UoC), tasked with driving technological advances in materials and turbine generation under the mentorship of specialist expertise within strong collaborative research environments.

In response to making communities safer and seismic steel construction more cost effective, two PhD scholarships were also awarded for steel construction, one at UoA and one at UoC.

We're pleased to report three of these PhD's were awarded during this time and successfully gained employment post study. This certainly reflects the strength these scholarship opportunities have for our youth joining our industry ranks.

| Supporting professional development | We've backed professional development within our industry - connecting with international expertise in a bid to keep New Zealand engineers on the forefront of technical advances.

Aligning with HERA's 'Design and Analysis of Welded Connections' Lecture Series by Germany's Professor Adolf F. Hobbacher from the University of Applied Sciences of Wilhelmshafen was a great success. Attended by over 120 engineers in Auckland, Hamilton, Queenstown and Wellington, positive reaction clearly showed there's a demand for career development platforms where engineers are actively seeking a stronger technical core to help them win and deliver work.

We've also promoted metals-based engineering as a career - supporting HERA's Final Year Project awarded to mechanical engineering students from UoA and Auckland University of Technology and the co-sponsorship of the Victoria University Arch Eng Awards, made possible through the generous donation of former Keith Smith Memorial Award winner Nick Calvarias.

Supporting youth in their career pathway

4 Masters students

Howard Zheng
Katrina Dacillo
Jansell Jamero
Thore Brodersen

5 PhD students

Choon Sang Wong
Matthew Proctor
Shoulong Dong
Audsley Jones
Kingsley Ukanwa

| Acknowledging success in our industry | We continue to recognise excellence through our commitment to building a strong technical culture within our industry, this year contributing towards the sponsorship of the IPENZ New Zealand Engineering Excellence (NZEE) Awards and its William Pickering Award for Engineering Leadership. We were proud to present this to distinguished IPENZ Fellow, Robin Dunlop, recognised for his outstanding contribution to the engineering profession and community.

The Metals Industry Conference also saw the HEERF Endowment Funded Keith Smith Memorial Award handed to Dr Nigel Evans in recognition of his contribution to make the steel manufacturing process work at NZ Steel.

Our future outlook

We're proactively invested in the future of our industry and dedicated to supporting its long term success – as we look forward to the inception of an exciting research and scholar program recently outlined to the Trustees for FY2017 in support of up and coming students in their quest for a career in the metals industry.

As we pursue top class research, innovation and understanding of disruptive technologies to boost engagement and innovation within our workforce - I'd remind you that you have an opportunity to make a real difference.

A small donation can immediately have an impact on the future of our workforce and ability to share and foster expertise – because if our industry isn't willing to support itself, who will?

And as your Chairman, I'd like to encourage you to make a living donation now – not only to be able to see the positive difference your contribution can make, but also so you can benefit from the tax rebates you're given through supporting a charitable trust.

Our people

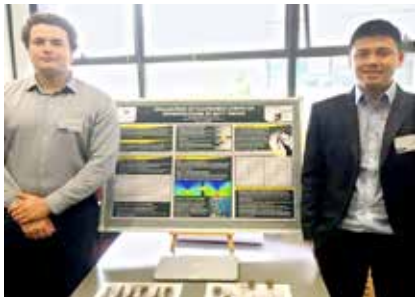
Our Foundation relies on the generosity of our industry and the support of our board - and we'd like to thank those who've been a part of our journey this year.

I look forward to seeing the rewards of our efforts to promote and grow the metals industry over the next few years as I commit to another term as Trustee - together with Dr John Meikle, Duncan Fraser, Mike Lehan and Wolfgang Scholz.

Interested in donating?

Please contact Secretary, Wolfgang Scholz for further details on +64 21 945 159 or via email exec@hera.org.nz

Noel Davies
Chairman



|Top left | IPENZ President Andrew Read, William Pickering Award recipient Robin Dunlop and HERA Director Wolfgang Scholz | Top right | Chairman Noel Davies, Dr Nigel Evans and Hon. Todd McClay | Bottom left | University of Auckland Samuel Lincoln and Kelvin Hor with their winning research display | Bottom right | HERA Executive / AUT Professor Dr Thomas Neitzert presenting the HERA engineering award to University of Technology Maxine Aldred

Our interns

Maxime Schwartz | France
ECAM Strasbourg

Paul Schnuch | Germany
University of Wilhelmshaven

Supriya Roy | New Zealand
University of Auckland

Advocacy

FY2016 has seen us continue our focus to be the voice for our industry by influencing political, economic, social systems and institutions through robust research that informs policy change for our members.

Our industry landscape is an ever changing one – so ensuring the best interests of our members remain at the forefront of our government's mind is crucial.

Our members have asked us to lead the charge on policy change for our industry - and as a research association, we've responded by providing the facts needed to help advocate for change. To hit the right balance, we've limited our work in this space to topics where we are competent and can deliver the supportive research needed to inform other stakeholders on what matters – handing those projects which fall outside of this scope to partners best suited to assist.

Government Procurement

Our industry is supporting government in its free trade efforts and endorses the WTO aligned Government Rules of Sourcing. To delve deeper, we commissioned BERL to compare New Zealand Procurement 'Rules' with those of our major trading partners (HERA Report R5-60:2016) - confirming we are in line with our GPA trading partners except for subcontractors being exempt from having to comply.

However, this research has also shown our 'Rules' have specific requirements to comply with the '5 Principles' which includes balanced decision making – requiring the mandated consideration of the economic, social and environmental impacts of procurement alternatives, raising issues around 'fair opportunity to respond' in many public tenders for our industry. Application research in relation to the HERA developed Advisory Notice Guidance Template to meet the Government 'Rules' requirements showed that the local procurement chain can demonstrate significant positive economic, social and environmental impacts - which if considered as mandated may balance procurement decisions transparent and demonstrable in our industry's favour. Going forward, if we're to get our public sector procurers to uniformly meet, the 'Rules' must remain high on our industry's advocacy priority list.

Product Conformance

True to our strategic aim that our industry can only be internationally competitive if we meet contracted requirements and applicable standards in all respects, we have continued in our quest to have our industry battle ready through demonstrable product conformance.

Based on our deep understanding of international best practice together with the assumptions made in design standards, in co-operation with SCNZ and Metals NZ, we've consulted with our industry members, whom advocated strongly for the introduction of independent third party verification for all critical building work – which in the case of steel products is through organisations such as ACRS. We're pleased to observe that this seems to have bared fruit and we can expect some major move from the regulator.

And, to ensure that key stakeholders such as the Construction Industry Council, SESOC and AWATEA, IIW, IABSE, ACRS, ISO and AS/NZS standards bodies get it right, our General Managers and Director have been working hard to be the voice of our industry - representing our industry on the Boards and committees of these organisations to keep in tune with what's truly going on.

Metals NZ

We're a strong supporter of Metals NZ, providing office support, staff engagement and sponsorship of their 'Securing the Industry Future' project. CEO Gary Hook uses our research in his submissions and policy formulations and provides the sector overarching voice for all metals industry interest.

Gary has had an outstanding year, providing us with a fantastic Metals Week including our Metals Industry Conference - broadening his stakeholder network and representing our industry on countless occasions, including to MBIE's procurement Business Reference Group. As an industry sector conscious of the fact that only with a strong unified voice we can achieve a sustainable industry - we all need to do more to support his effort to run a strong Metals NZ to achieve change.

Gary Hook, CEO Metals NZ

Verification

We've gone from strength to strength to deliver our quality compliance scheme to members and ensure safety and reliability of steel structures in New Zealand is achieved.

We're helping our members to adhere to international best practice and maintain a competitive edge by providing them with an important point of difference for locally fabricated steel against imported fabricated alternatives through our scheme.

We recognise that helping to evaluate and pre-qualify our steel fabricators ensures they have the capability and quality management systems in place to undertake work to the required standard, providing certification through HERA Certifications Ltd.

The induction of our latest group of structural steel fabricators Patton Engineering, Cambridge Steel Fabricators & Engineers, Weldlok (NZ), Action Engineering and Modern Construction at the 10 year anniversary of SCNZ in Queenstown was another milestone to celebrate.

We're proud to report that in only two years, SFC certification has become a quality mark as "state of the art" for the New Zealand structural steel industry, with a significant growth in numbers of certified companies expected in the upcoming years.

SCNZ, HERA and MP Minister for Small Business Craig Foss presenting SFC certificates at the 10th SCNZ anniversary, Queenstown

HERA Certification Ltd is the International Institute of Welding (IIW) Authorised National Body for Companies Certification (ANBCC) for New Zealand to IIW MCS ISO 3834.

All activities of HERA Certification Ltd are controlled by an independent Governing Board, including representation from the NZ fabrication industry and other interested parties.

ISO 3834 is a key part of SFC scheme, reflecting the significance of the quality of welded connections for the safety and reliability of steel structures subject to high-strain earth quake loadings.

The SFC scheme continues to grow fast, with the latest group of five structural steel fabricators achieving certification in April 2016. A total of 21 New Zealand fabricators have now achieved SFC certification, ensuring that around 75% of the local industry output is meeting requirements of the SFC.

Wolfgang Scholz
Chairman, HERA Certification Ltd

Steel Fabricator Certification (SFC) Scheme

Developed with SCNZ, the SFC scheme provides assurance to specifiers that our steel industry delivers conforming steel construction.

Chairman's report HERA Certification Ltd

We established our certification arm HERA Certification Ltd to provide New Zealand fabricators a world-class certification system to AS/NZS ISO 3834.

Green Star steel credit

With growing climate concerns worldwide, industries have been forced to relook how they interact with the environment and most importantly - challenged to adopt clean, sustainable thinking into their practices.

In response, the New Zealand's commercial infrastructure space has aligned to the Green Star rating - undertaking assessment in both the design and build phases of a project to assess their overall environmental impact.

Recognising this, we've actively worked with the Sustainable Steel Council to ensure New Zealand steel is dealt with fairly in this rating system – not only continuing to support steel reinforcement, but expanding the scope of the Green Star steel credit to include structural steel buildings.

Our involvement has also seen us align with the New Zealand Green Building Council (NZGBC) to ensure the scope of steel expanded past recycled steel – giving our members in the heavy engineering sector the ability to measure their sustainability and improve their global standing in climate reform.

Our works have also led to the credit system including internationally recognised Environmental Product Declarations (EPD's) in their assessment – allowing more than a single ecolabel type to be recognised to demonstrate a products sustainability attributes.

Ensuring that the complete value chain is recognised, we've armed those of our members who have Environmental Management Systems (EMS) with the opportunity to improve their ratings by ensuring the complete value chain is recognised - including the impacts of fabrication and processing.

We're excited by the prospects that this verification process will hold for our members – with those who achieve this sustainability rating, no doubt opening up the door to opportunity on the international market.

| 1 | Hawkins & Novare Design - Canada Street bridge | 2 | Jensen Steel - SFC audit by HERA staff | 3 | Donovan Gro
Alice's tunnel boring machines cutting head being lifted into place after assembly | 6 | Baker Cranes - Two 3.2t Ba
feeder exported to Australia and South Africa | 8 | Grayson Engineering - Seismic connections for Christchurch | 9
site | 11 | Courtesy of Construction News - erecting Alice at Waterview Connection | 12 | Piletech - pile drivers at K
for the TVCC building in China | 15 | Waikato Steel Fabricators - Project Florence, pipe bridges for Fonterra Lichfiel


9


11


10


12


14


13

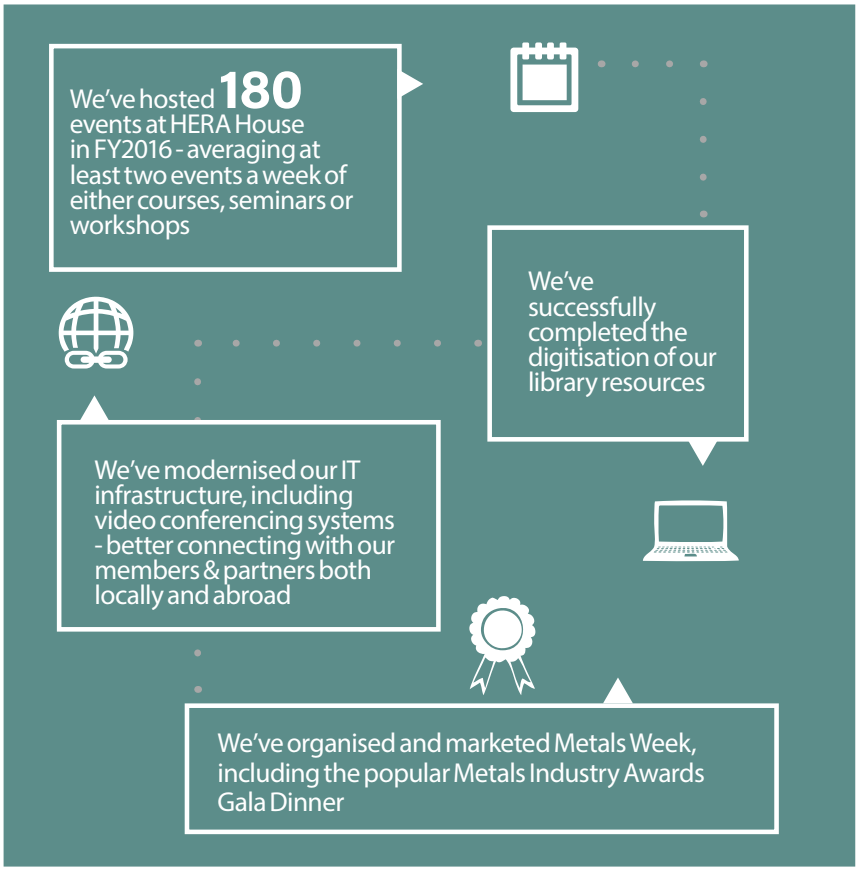

15


16

up / NZ Steel - Innovation-award winning design in Kaiapoi | 4 | S&T Comflor Exporter Award nominee product in use | 5 | Page Macrae Engineering - ker cranes for Primero Profiles in Mt Wellington designed for high duty and equipped with M7 hoists | 7 | Duncan AG - NZ built and designed 4Bale multi & 10 | Lewis Bradford - works on 'Spires' a 180kg aluminium sculpture designed by Neil Dawson installed at Latimer Square Christchurch, and installed on Kirkbridge Rd intersection | 13 | Calder Stewart - Metals Innovation Award winning engineering facility | 14 | Farra Engineering - supplied access equipment ld | 16 | A-Ward Attachments - Winner of the Metals Industry Exporter award - container tilter in action

Resources

Our information team works hard to ensure our members not only are managed well, but have access to the technical resources and publications needed to inform their work on the ground – extending their support to coordinate industry and external events, and administrative assistance to valued partners.



Our research has resulted in new resources to better inform our members in their work

9 Journal papers
- 3 Industry Development
- 6 Structural Systems

20 HERA publications
- 1 Joint Weld & Structural
- 17 Industry Development
- 2 NZ Welding Centre

20 Conference papers
- 5 NZ Welding Centre
- 8 Industry Development
- 7 Structural Systems

* Please refer to appendix for full listing of papers and publications made available in FY2016

HERA at Metals Week 2015

Held at the Aotea Centre Auckland from 31 August to 4 September, this week was the culmination of works started in 2014 by the Metals New Zealand Executive to create a significant and overarching event involving as many member associations as possible.

By coming together to communicate our industry scale, capability, and relevancy to New Zealand's economy for both internal and external stakeholders we were able to:

- Drive conferences that inform and inspire
- Broaden industry networking opportunities
- Deliver efficiencies in facility costs and event organization, and
- Celebrate excellence and recognise the efforts and results of people working in our industry

Our Information Centre Manager Brian Low worked closely with Metals NZ CEO Gray Hook, NZ Steel marketing professionals, conference coordinators and Industry Award Gala Dinner Event Manager to ensure our metals-based industry had a strong presence and was well represented - working hard to deliver support during the planning, execution and delivery of the event.

We were also proud to be a key participant and organiser of the Metals Industry Conference at the Sky City Convention Centure - hosting a session and delivering 12 papers from our staff, including a Rod Oram facilitated Industry Strategy session with the HERA Executive and members.

|Left | Economic commentator and business journalist Rod Oram running a discussion with HERA members on his research around the mid to long term prospects of our industry
|Right | Metals Industry Award Gala Dinner held in the Rendezvous Hotel Ballroom with 17 awards presented, with four from HERA

Marketing

We're working hard to recognise market needs that can be linked to scientific research to create targeted business development initiatives for our members. We know this will allow them to focus on their core business with peace of mind that future opportunities are being identified and developed in the background.

Remaining competitive and relevant in the market continues to be a challenge for our members, and now more than ever – providing them with the tools needed to help them with their business development is crucial.

Creating business opportunities

We know the value of connecting the right companies to new transformational project ideas, linking both deep experience and innovative thinking to successfully bring products to the international market.

Now poised to drive R&D in the ocean engineering space, we've started the process of touching base with our members who have strong track record in the marine sector - so we can capture their capability to support the securing of strong partnerships and government funding as we move forward.

Our industry development roadmap process has helped pave the way as we work to achieve faster market entry and robust competitive product offerings on the global stage by encouraging our members to move from a contracting to a manufacturing base - using an integrated approach that identifies common overlaps in the market, member capability and research to inform where opportunities exist. So far, our geothermal roadmap has delivered clear market understanding and access for AGGAT programme partners, with end users now secured once ORC technology is ready for uptake.

Improved and targeted communications

We've started a journey to react to our member needs – as we look to change our communication approach to provide value through an improved tone, look and feel in our branding and content we share.

Delivered across digital applications, we're proud of the proactive steps we've taken to become a stronger, more modern and polished association that our members can rely on for trusted support and expertise.

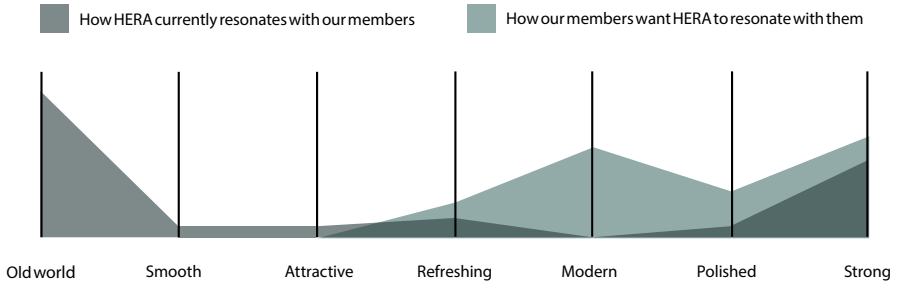
We look forward to these transformations as they're implemented in phases over the coming year - with work already done to engage with a brand and web designer to update our current website offering to be a more user friendly experience for those interacting with us or seeking access to our resources.

Delivering value focused content for members has seen us:

Improve our Twitter engagement - averaging 13.7K impressions per month (from 200)

Grow our LinkedIn followers by 55% since FY2015

Our member feedback has driven positive change



Financial notes & statements

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REPORT OF THE INDEPENDENT AUDITOR ON THE SUMMARY FINANCIAL STATEMENTS

To the Executive Committee of New Zealand Heavy Engineering Research Association Incorporated

The accompanying summary financial statements, which comprise the summary statement of financial position as at 30 June 2016, the summary statement of comprehensive revenue and expense, summary statement of net assets/equity and summary statement of cash flows for the year then ended, and related notes, are derived from the audited financial statements of New Zealand Heavy Engineering Research Association Incorporated for the year ended 30 June 2016. We expressed an unmodified audit opinion on those financial statements in our report dated 23 September 2016.

The summary financial statements do not contain all the disclosures required for full financial statements under generally accepted accounting practice in New Zealand. Reading the summary financial statements, therefore, is not a substitute for reading the audited financial statements of New Zealand Heavy Engineering Research Association Incorporated.

Executive Committee's Responsibility for the Summary Financial Statements

The Executive Committee is responsible for the preparation of a summary of the audited financial statements in accordance with PBE FRS 43: Summary Financial Statements.

Auditor's Responsibility

Our responsibility is to express an opinion on the summary financial statements based on our procedures, which were conducted in accordance with International Standard on Auditing (New Zealand) (ISA (NZ)) 810, "Engagements to Report on Summary Financial Statements."

Our firm has formatted the financial statements of New Zealand Heavy Engineering Research Association Inc. to which our audit opinion relates, working from completed records which we have audited. We have had no involvement in the compilation of those records or the entries they contain.

Our firm have assisted in the conversion from "Old GAAP" to PBE Standards. This involved assessing the impact, analysing the balances and preparing journal entries. The advice provided on the conversion process was provided by members of the RSM Team who were independent of the audit. Other than in the provision of these services and in our capacity as auditor we have no relationship with, or interests, in New Zealand Heavy Engineering Research Association Incorporated.

Opinion

In our opinion, the summary financial statements derived from the audited financial statements of New Zealand Heavy Engineering Research Association Inc. for the year ended 30 June 2016 are consistent, in all material respects, with those financial statements, in accordance with PBE FRS 43.

23 September 2016

Heavy Engineering Research Association

Accounting policies to the summary statements

Summary statement of comprehensive revenue and expense for the year ended 30 June 2016

	Notes	2016	2015
		$	$
Revenue from non-exchange transactions		2,842,493	2,592,883
Revenue from exchange transactions		940,665	715,379
Total Revenue		**3,783,158**	**3,308,262**
Total Expenses		3,247,599	2,784,144
Finance income		21,878	15,911
Net surplus for the year		**557,437**	**540,029**
Other comprehensive revenue and expense		-	-
Total comprehensive revenue and expense for the year		**557,437**	**540,029**

Summary Statement of Changes in Net Assets/Equity	$
Total equity at 1 July 2014	544,856
Total comprehensive revenue and expense for the year ended 30 June 15	540,029
Closing equity at 30 June 2015	1,084,885
Total comprehensive revenue and expense for the year ended 30 June 2016	557,437
Closing equity 30 June 2016	1,642,322

Summary Statement of Financial Position
As at 30 June 2016

	2016	2015
	$	$
Current Assets	2,046,618	1,359,050
Non-Current Assets	402,163	381,603
Total Assets	2,448,781	1,740,653
Current Liabilities	806,459	655,768
Non-Current liabilities	-	-
Total Liabilities	806,459	655,768
Total Net assets	1,642,322	1,084,885

Summary Statement of Cash Flows
For the year ended 30 June 2016

	2016	2015
	$	$
Net cash flows from or used in operating activities	857,021	787,919
Net cashflows from or used in investing activities	(919,608)	(345,849)
Net cash flows from or used in financing activities	(219,751)	(93,249)
	(282,338)	348,821
Net increase in cash and cash equivalents	(282,338)	348,821
Cash and cash equivalents at 1 July	1,016,577	667,756
Cash and cash equivalents at 30 June	734,239	1,016,577

RSM

Heavy Engineering Research Association

Accounting policies to the summary statements

Summary statement of comprehensive revenue and expense for the year ended 30 June 2016

1. REPORTING ENTITY

New Zealand Heavy Engineering Research Association Incorporated (the "entity") is an Incorporated Society which was incorporated under the Incorporated Society Act 1908 on the 30th day of August 1978.

These financial statements were authorised for issue by the Board on 14 September 2016.

2. BASIS OF PREPARATION

a) Statement of compliance

The financial statements have been prepared in accordance with New Zealand Generally Accepted Accounting Practice ("NZ GAAP"). Not-For-Profit PBE IPSAS – RDR.

The Society is a public benefit entity for the purpose of financial reporting and the financial statements comply with Public Benefit Entity Standards Reduced Disclosure Regime ("PBE Standards RDR"). For the purposes of complying with NZ GAAP, the Society is a public benefit not-for-profit entity and is eligible to apply Tier 2 Not-For-Profit PBE IPSAS on the basis that it does not have public accountability and it is not defined as large. For the year ended 30 June 2015, the entity prepared its financial statements using Old GAAP. These have now been restated to Not-For-Profit PBE IPSAS – RDR. There have been no changes to these financial statememts, except forr the diclosure of statement of cash flows, which has been disclosed.
All reduced disclosure regime exemptions have been adopted.

The financial statements have been prepared on the historical cost basis.

The financial statements are presented in New Zealand Dollars ($), which is the functional and presentation currency, rounded to the nearest dollar.

The summary financial statements are presented in summary form and therefore do not give all the information required by Generally Accepted Accounting Practice in New Zeland using PBE Accounting Standrads (PBE IPSAS) Reduced Disclosure Regime. The Summary Financial Statements have been prepared in accordance with FRS 43 Summary Fianncial Statements. Due to the summarised nature, these sumary financial statements cannot provide a full understanding of the financial performance and financial position of the Company. The understanding can only be obtained by reference to the annual financial statements of the Company which is available from the registered office.

2. Nature of Audit Opinion

The full financial statements for the year ended 30 June 2016 has been audited, with an unqualified audit opinion being issued.

Notes to the summary financial statements

1. RELATED PARTY TRANSACTIONS AND BALANCES

Related party transactions

The Heavy Engineering Educational Research Foundation (HEERF) is a related party to the Association. The New Zealand Heavy Engineering Research Association ("HERA") Chairman, the HERA Deputy Chairman and HERA Executive member Noel Davies are HEERF trustees.

Related party transactions		**2016**		**2015**
Management fee received	$	(6,000.00)	$	(6,000.00)
Administration fee received	$	(10,000.00)	$	(10,000.00)
Rent paid	$	276,220.00	$	241,540.00
Grants received	$	(113,599.00)	$	(113,093.00)

Related party balances		**2016**		**2015**
Loan payable to HEERF	$	-	$	(69,751.00)
Loan receivable from HEERF	$	150,000.00	-	

2. OPERATING LEASE COMMITMENTS

New Zealand Heavy Engineering Research Association has entered into a lease agreement to lease HERA House from Heavy Engineering Research Foundation.

Future minimum rentals payable under non-cancellable operating leases are as follows:

		2016		**2015**
Within one year	$	276,216.00	$	276,216.00
After one year but not more than five years	$	828,648.00	$	1,104,864.00
More than five years	$	1,519,188.00	$	1,795,404.00
	$	2,624,052.00	$	3,176,484.00

RSM

Heavy Engineering Research Association

2016 Publications and Papers

Industry Development

Thesis papers

- Dacillo, K.B. (2016). *Stress Corrosion Cracking in Metal Alloys Exposed to Corrosive Geothermal Fluids.* Master of Engineering thesis in Engineering Science. New Zealand, Auckland: The University of Auckland.
- Jamero, J.L. (2016). *Mineral Scaling in Geothermal Two-Phase Pipelines.* Master of Engineering thesis in Engineering Science. New Zealand, Auckland: University of Auckland.
- Proctor, M. (2015). *Modelling, Control and Optimisation of Geothermal Organic Rankine Cycle Power Plants.* PhD thesis in Chemical and Materials Engineering. New Zealand, Auckland: University of Auckland.
- Wong, C. (2015). *Design-to-resource (DTR) using simulation-meanline-computational (SMC) turbine adaptive strategy, design process of low temperature organic Rankine cycle (LT-ORC).* PhD thesis in Mechanical Engineering. New Zealand, Christchurch: University of Canterbury.
- Zheng, H. (2015). *Expert design tool online deployment.* Master of Engineering thesis in Chemical and Materials Engineering. New Zealand, Auckland: University of Auckland

Journal papers

- Proctor, M.J., Yu, W. & Young, B.R. (2016). *An Approximate Self-Optimizing Control Method Applied to Geothermal Organic Rankine Cycle Power Plants*. Submitted to Journal.
- Proctor, M.J., Yu, W. & Young, B.R. (2015). *Simulation of set-point feed-forward control of wellhead valves in an organic Rankine cycle geothermal power plant.* 4. Asia-Pacific Journal of Chemical Engineering 10, p.501-11.
- Proctor, M.J., Yu, W., Kirkpatrick, R.D. & Young, B.R. (2016). *Optimisation of Geothermal Flow into an Organic Rankine Cycle Power Plant.* Submitted to Journal.

Conference papers

- Abbas, H. (2016). *Novel Heat Transfer Concepts using R245fa in Organic Rankine Cycle with High Temperature Exhaust Gas.* Ireland, Belfast: 3rd Engine ORC Consortium Workshop.
- Abbas, H., Habib, B., Farid, M. (2016). *New concepts for R245fa application in high temperature waste heat and geothermal systems.* New Zealand, Auckland: 38th New Zealand Geothermal Workshop.
- Chen, L. (2016). *Aerodynamic design and stress analysis of 100kW radial inflow turbine for organic Rankine cycle system.* New Zealand, Auckland: 38th New Zealand Geothermal Workshop.
- Chen, L. (2016). *Aerodynamic design and stress analysis of 100kW radial inflow turbine for organic Rankine cycle system.* Ireland, Belfast: 3rd Engine ORC Consortium Workshop.
- Dacillo, K.B., Zarrouk, S. (2016). *Stress Corrosion Cracking in Metal Alloys Exposed to Acid-SO4-Cloride type Geothermal Fluid.* New Zealand, Auckland: 38th New Zealand Geothermal Workshop.
- Dong, S., Habib, B., Zheng, H., Abbas, H., Chen L., Heinzel, H., Lie, M., Yu, W., Young, B.R. (2016). *Software integration in the development of expert design tool for organic Rankine cycle.* New Zealand, Auckland: 38th New Zealand Geothermal Workshop.
- Jamero, J.L., Zarrouk, S. (2016). *Mineral scaling in geothermal two-phase pipelines*. New Zealand, Auckland: 38th New Zealand Geothermal Workshop.
- Lie, M., Habib, B., Yu, W., Young, B. (2016). *Dynamic modelling and control design for organic Rankine cycle systems.* New Zealand, Auckland: 38th New Zealand Geothermal Workshop.

HERA Publications

- Abbas, H. (2016). *Design and Optimization of Highly Finned Tube Condenser in ORC.* Internal Report R5-62:2016. New Zealand, Auckland: Heavy Engineering Research Association.
- Abbas, H. (2016). *Design and Optimization of Operating Conditions of Brazed Plate Heat Exchanger Condenser in ORC Engine*, Internal Report R5-63:2016. New Zealand, Auckland: Heavy Engineering Research Association.
- Abbas, H. (2016). *New Concepts for R245fa Applications at High Temperature Exhaust Gas ORC Direct Application*, Internal Report R5-64:2016. New Zealand, Auckland: Heavy Engineering Research Association.
- Abbas, H. (2016). *Innovative Concept of Porous Media Inside Tubes in Evaporator and Condenser.* Internal Report R5-65:2016. New Zealand, Auckland: Heavy Engineering Research Association.
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ISBN 1170-3075