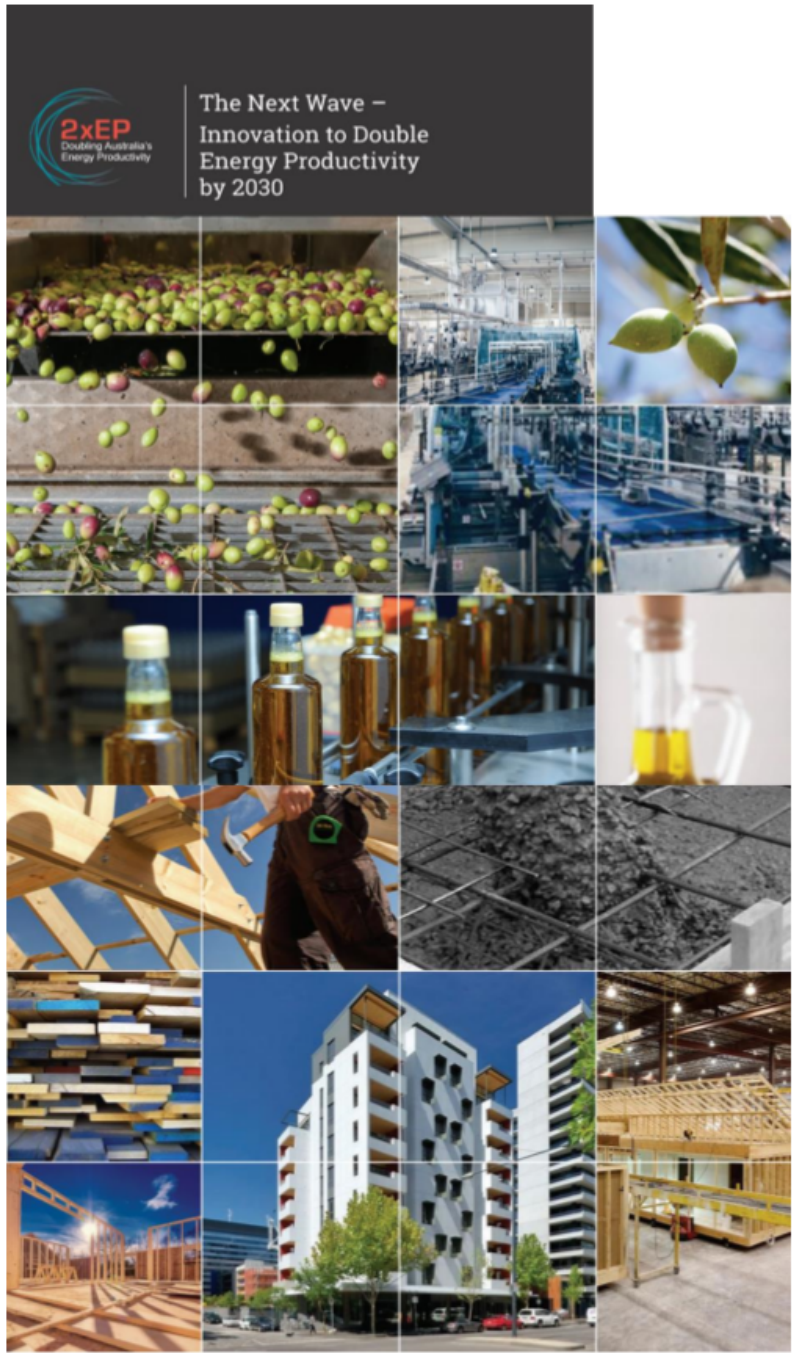
2xEP
Doubling Australia's Energy Productivity

A2EP – 2xEP Energy Productivity Summit
04-05 April, 2017
Australian National Maritime Museum
Darling Harbour, Sydney

Session 07
2xEP by 2030: How? Why?
2xEP and net zero emissions

Paul Graham
Shauna Coffey
Alan Pears > presentation follows
Gordon Weiss
Chair: Amandine Denis

AUSTRALIAN ALLIANCE FOR ENERGY PRODUCTIVITY
Doing more. Using less.



Adding Value and cutting emissions through Energy Productivity: A2EP's Innovation Approach

Alan Pears AM

Senior Industry Fellow RMIT University

Lead author of *Next Wave*

A2EP Summit, Sydney 4-5 April 2017

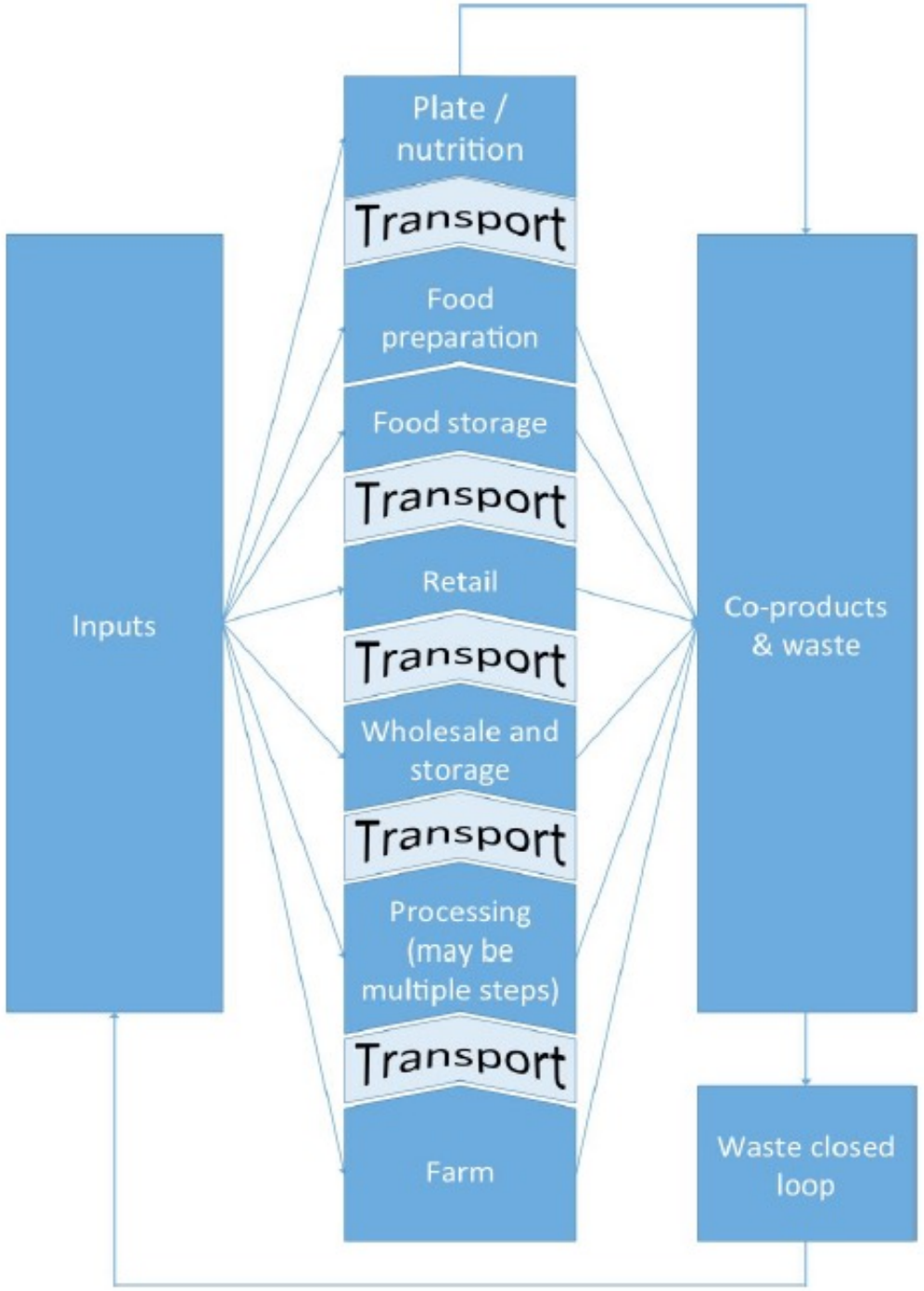
The Next Wave – Innovation to double energy productivity by 2030 and cut emissions
Report available from : http://2xep.org.au/innovation-the-next-wave.html

Project background and focus

- Aim to complement A2EP *Sector Roadmaps* by looking for substantial innovations with potential to improve energy productivity by 2030
- First stage report includes:
  - Global scan of innovations
  - Development of 'Value Chain' approach
  - Application of VC approach to 'farm to plate' and 'raw materials to shelter', along with 'systems and services' analysis
  - Identification of key services, eg food preservation, dewatering/drying, cooking
  - Draft criteria for selection of priority innovations
- Limited budget and poor data quality constrained quantification and scope
- Spin-off project now looking at 'smart' cold chain management to maximise value of food, minimise food waste and optimise system energy efficiency as an example of energy productivity improvement

The ‘Value chain’ approach

http://2xep.org.au/innovation-next-wave.html



- VC looks at major activities from sources of raw inputs to final service delivered
- ‘Productivity’ focus emphasises business potential beyond efficiency improvement
- Integration of energy and materials captures ‘embodied energy’ and reframes ‘waste’ as resource
- ‘First principles’ analysis of processes to deliver services (eg dewater, preserve food) explores scope for non-traditional solutions, technologies and business models
- ‘System’ thinking opens up potential to shift processes between VC elements, integrate or ‘package’ processes
- Participants in each element can see their role in overall system, focus on end-user service requirements and leverage other trends
- Technology innovation opens up potential for shifts to modular, distributed solutions, fuel switching, fundamentally more efficient system solutions, higher value outcomes

Criteria for selecting priority measures

- Primary criteria (major factors influencing energy productivity, economic development and climate impact):
  - Energy savings delivered
  - Enhanced value created
  - Export/employment potential
  - Reduction in climate impact
- Secondary criteria (factors affecting rate of adoption):
  - Readiness and potential market impact
  - Economics/ cost trends
  - Risks, barriers, support, infrastructure

- Report explores these in some detail for each priority measure

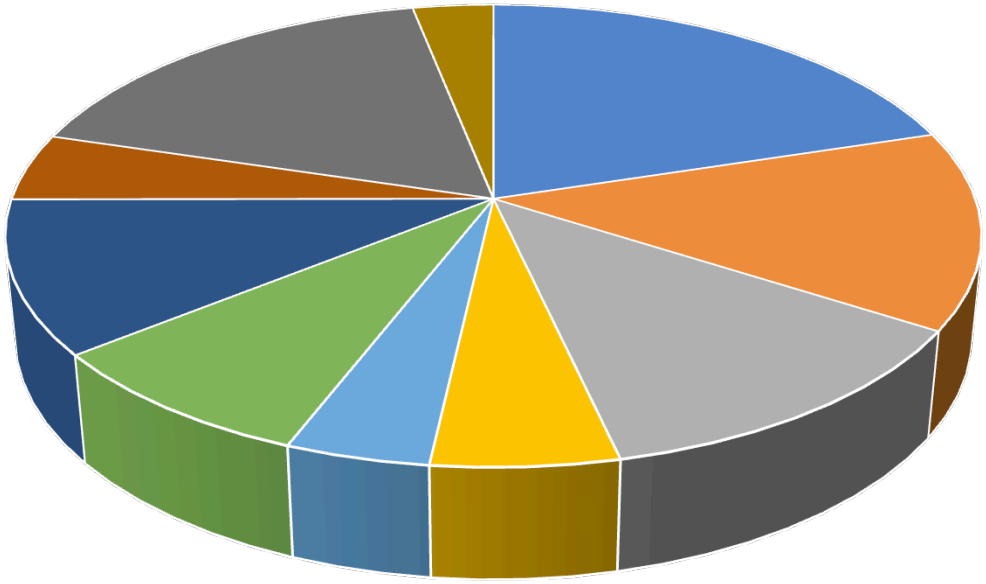
Priority measures

- Overarching:
  - Integrate *Internet of Things*, communications and cloud computing with smart, flexible process equipment to optimise, enhance efficiency and quality of service delivery
  - Integrate clean energy (ICE): energy productivity (including electrification and demand management), renewable energy, storage, distributed energy solutions, and 'smart' systems
- Farm to plate Value Chain
  - Electrify and modularise food processing: heat pumps for heating and (latent) heat recovery, mechanical vapour recompression and renewable energy (electricity, thermal)
  - Utilise dewatering as early as possible in value chain, removing water mechanically to reduce thermal loads and cut mass/volume for transport and further processing
  - Transition to high efficiency commercial cooking and food display systems
  - Step change in refrigeration energy, combining high efficiency systems with low carbon refrigerants
  - Optimise refrigeration use across the cold chain
- Raw materials to shelter Value Chain
  - Prefabricated construction with engineered timber and other low impact materials
  - Increase recovery of high value materials from building material waste
  - Utilise new technologies and business models to accelerate improvement of building energy performance
  - Promote optimal structural design and incorporate emerging materials and systems into structures
  - Transition to low emission steel production and implement a cement emissions reduction strategy

Some key messages and outcomes

- When primary energy used as indicator, commercial sector refrigeration, cooking/reheating/hot display are significant
- Lack of data on energy use by activity and benchmarks in commercial and industrial sectors is a serious problem for analysts and policy makers
- Many ways to avoid/reduce need for process heat – eg microfiltration, high pressure processing; advanced heat pumps can:
    - ‘upgrade’ low temperature heat (recovered from process or from renewable energy)
    - Recover latent heat from exhaust/waste streams, then upgrade for use in same process (using renewable electricity)
    - Produce industrial steam at or near point of use
- Big savings potential in refrigeration: eg optimise ‘smart’ cold chain, cascaded compressors, advanced insulation and design, leverage HFC phase-out
- Emerging options for steel and cementitious material production include zero and low carbon processes, switching to other solutions including material efficiency, smart design, alternative materials and replacing physical structures with virtual services

Very large potential to cut present $15 bill/year energy use in food chain



VALUE ADDING OPPORTUNITIES

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- Cut food waste, extend shelf life, enhance food quality
- Grow rural economies without fossil gas while integrating RE, storage
- Transform 'waste' into co-products, resources and clean energy
- Export and import replacement opportunities for products, IP practical IoT solutions applicable to regional economies
- Improved staff productivity, loyalty, OH&S
- Improved customer satisfaction, health
- Improved plant reliability and flexibility
- Service emerging niche markets

Can we double energy productivity (or more)?

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- Technologies – YES but need to aggressively drive innovation, demonstrate value and support adoption
- Economics – many economically viable (and improving) opportunities but many barriers and market distortions
- Business behaviour – many cultural issues
- Policy – need much higher priority, ambition and delivery capability
- Politics - ?????

- Energy productivity is unique in offering cost savings, enhanced value, helping energy system reliability and reducing climate impacts