



Signposts along the road to the Low Carbon Economy

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CAMERAS Conference, Dundee

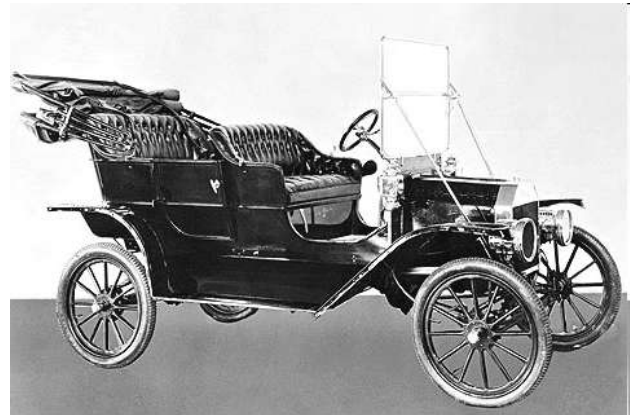
3rd of March, 2010

Itinerary



Where we came from

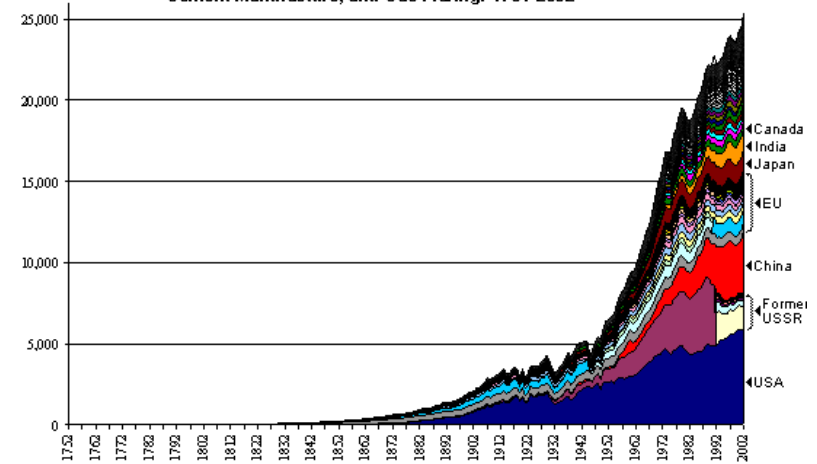
- Global economy underpinned by cheap, available hydrocarbon energy
- No concept of the effects of uncontrolled CO₂ emissions
- Biomass and renewable energy phased out to take advantage of increased energy availability



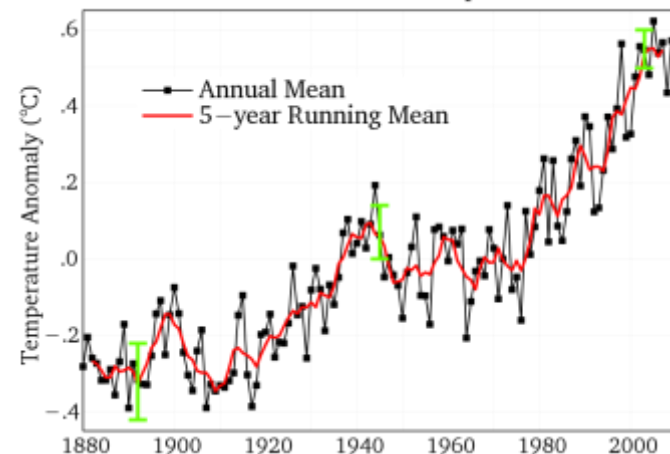
Where we are now

- Global economy underpinned by cheap, available hydrocarbon energy
- No public consensus of the effects of uncontrolled CO₂ emissions
- Biomass and renewable energy phased in to maintain future energy availability

Figure 2: Global CO₂ Emissions from Fossil Fuel Burning, Cement Manufacture, and Gas Flaring: 1751-2002



Global Land–Ocean Temperature Index



Fuel in the tank?

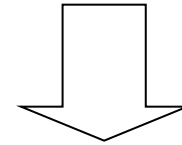
- Government commitment to reduce or control CO₂ production
- Mechanisms for the true cost of carbon to be reflected in energy prices
- Opportunity to develop solutions that can be exported globally
- Promise of sustainable 'green' jobs



Where are we going

- Learning from, and improving on, the knowledge of the existing energy industry
 - Understanding the resource
 - Bringing the costs down
 - Maintaining the skill base

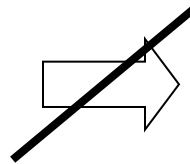
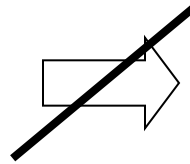
Energy



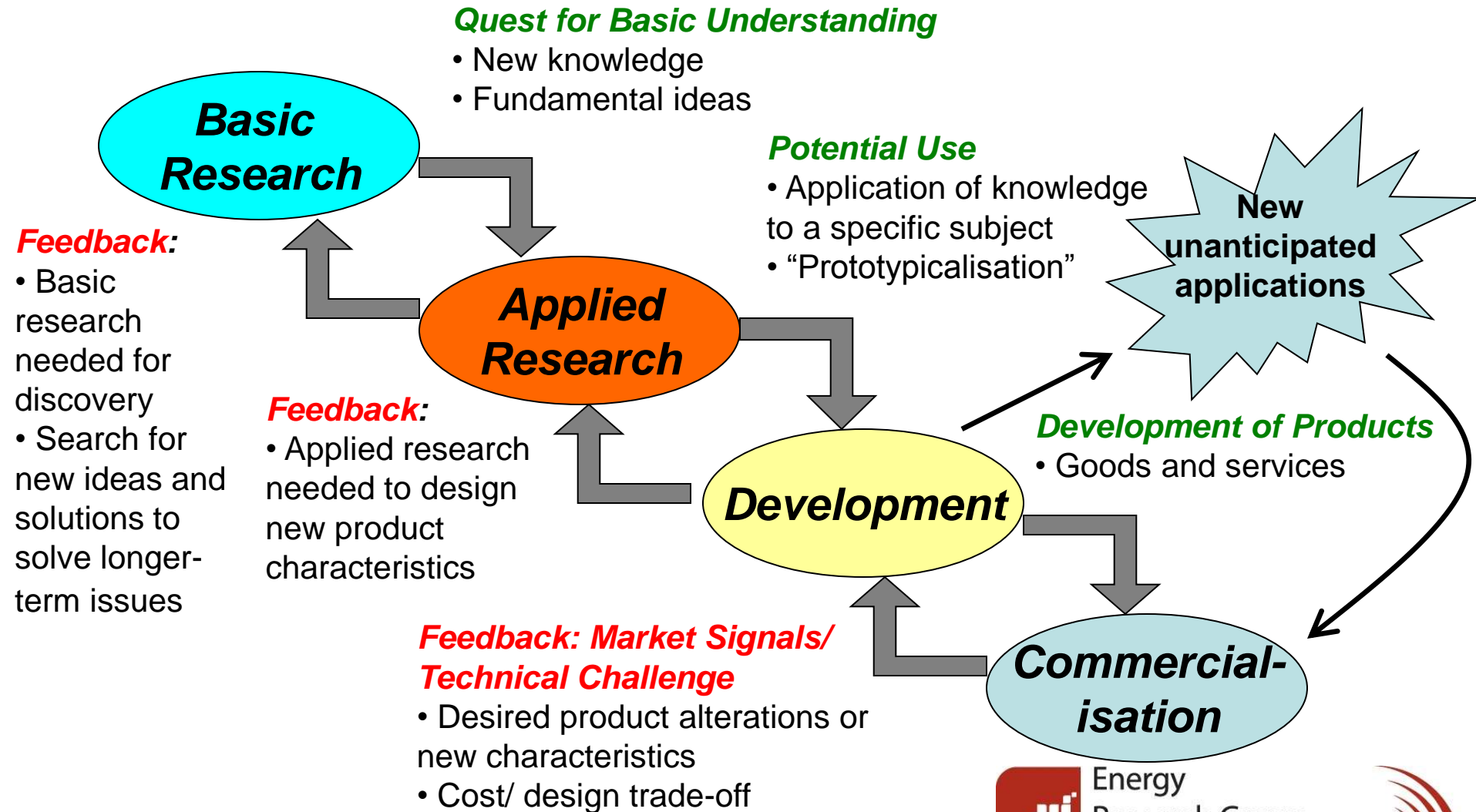
Energy



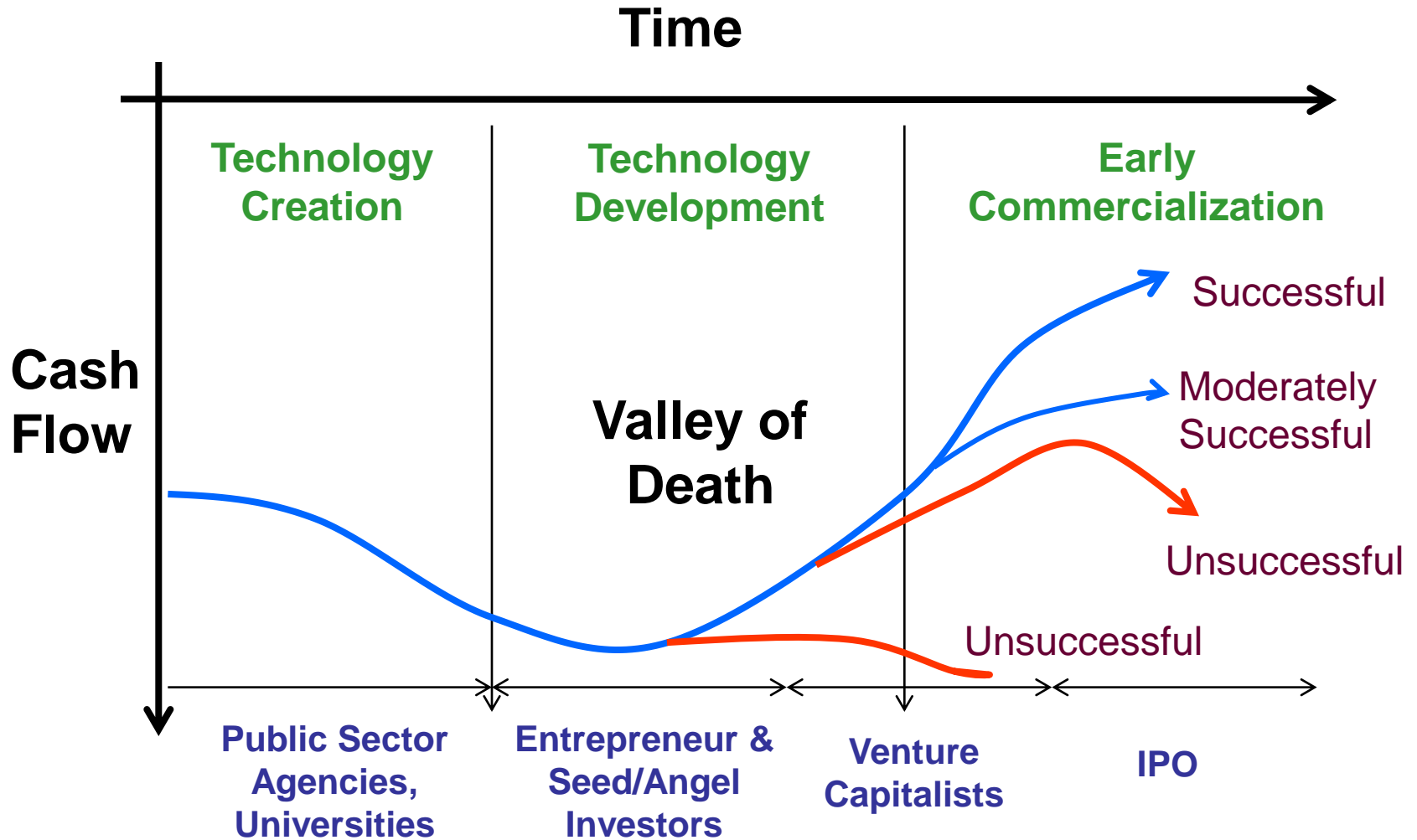
Not just business as 'almost' usual



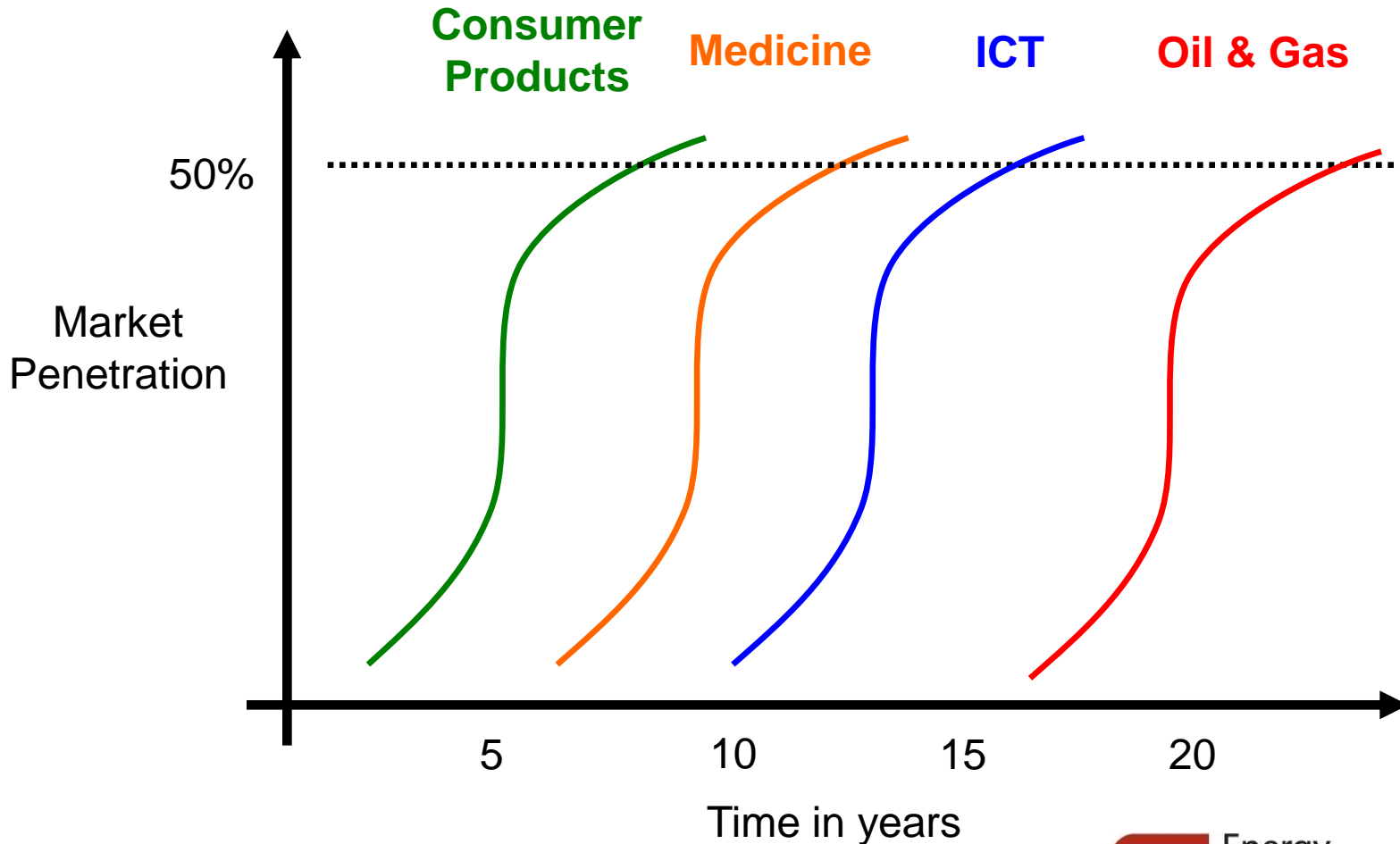
Cycle of Innovation



Good ideas are only the start...

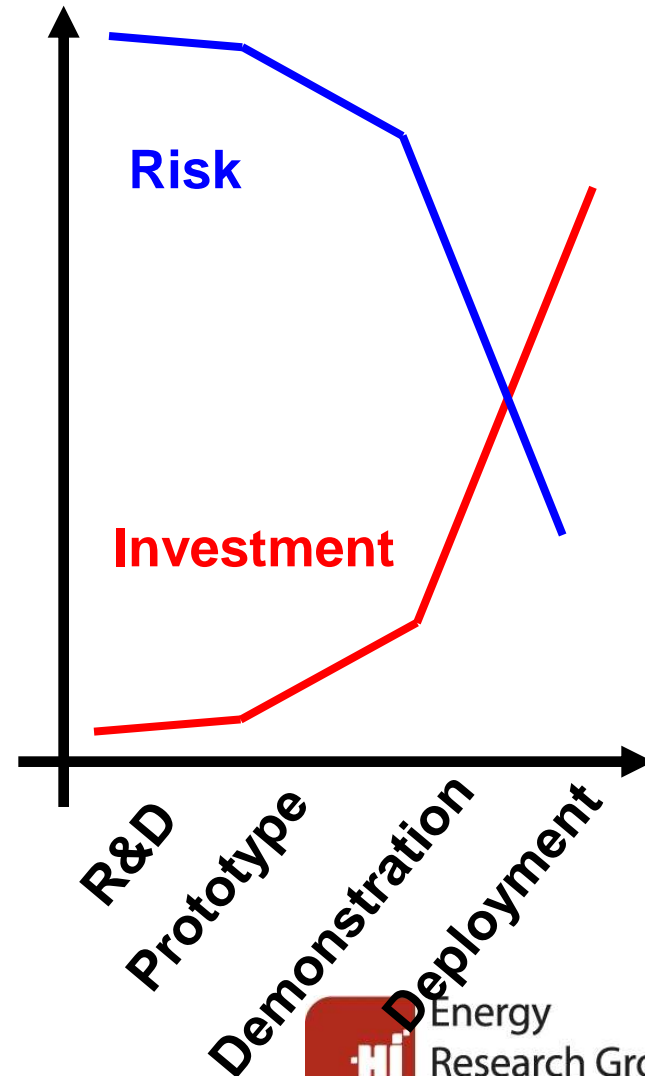


...and can't be rushed



Energy Innovation

- Long timelines
 - + Large capital investment
 - + Large investment multipliers
- = Deep & wide valley of death



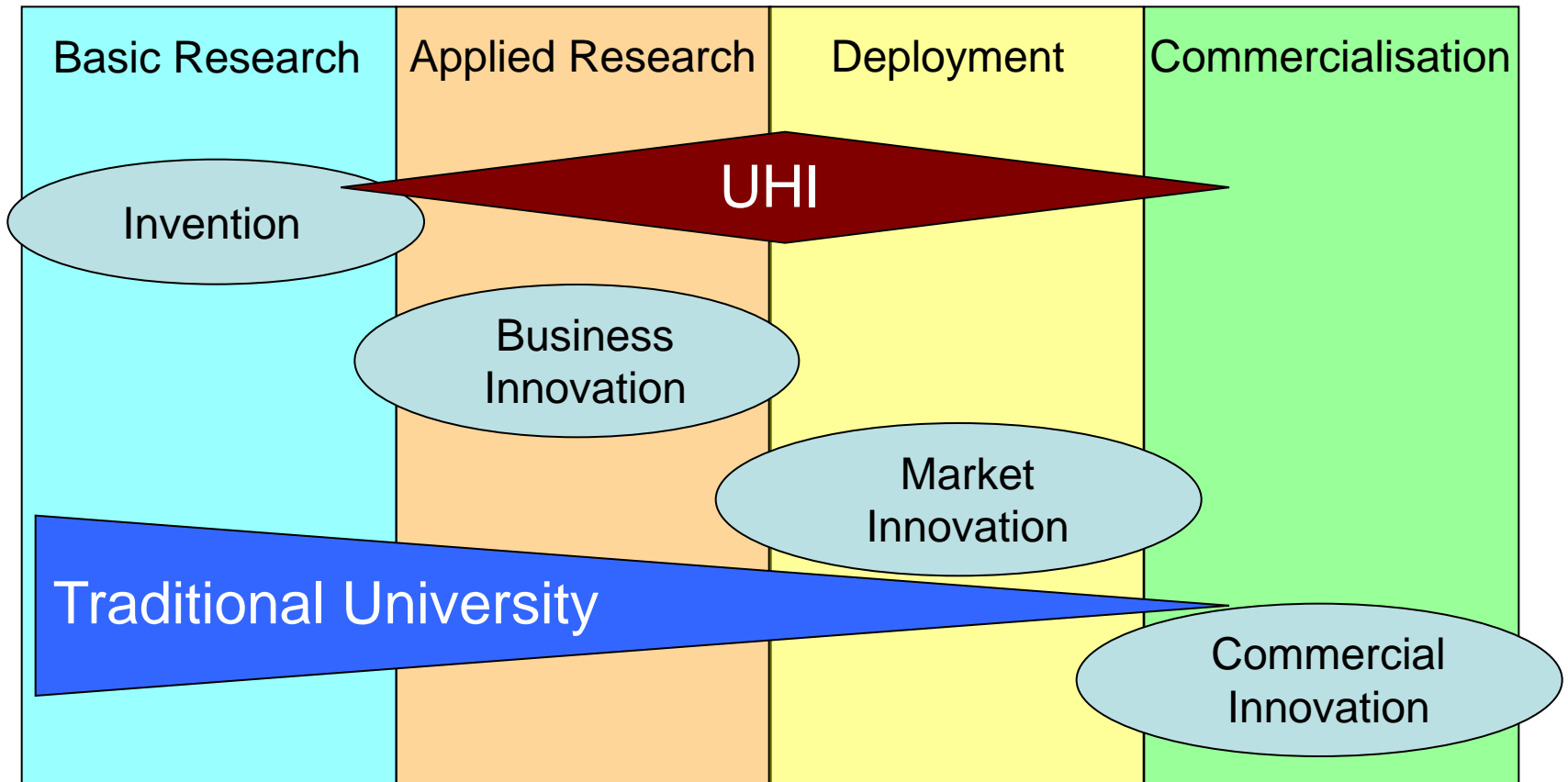
Highlights

- Potential tipping points to watch –
 - Beauly to Denny
 - Pentland Firth Allocations
 - Viking Wind
 - Renewable Heat Incentives
 - Feed in Tariffs





UHI position



UHI biofuel projects

- BioMara
 - A project investigating sustainable fuels from Marine Biomass; the potential use of both macroalgae and microalgae as alternatives to terrestrial agri-fuel production.
- ENRAPP
 - Using aquaculture related biomass as a raw material source for Anaerobic Digestion systems.



UHI biomass projects

- Biosorbents from Anaerobic Digestion Wastes
 - Production of bioenergy and novel biosorbents from anaerobically digested shellfish wastes.
- RASLWES
 - Regional Approach to Stimulating Local Wood Energy Solution a NPP preparatory project looking at local energy demand at a communities level and explores the approach and strategy for stimulating renewable energy deployment - with a focus on wood fuel markets
- clim-ATIC
 - NPP programme focused on bringing together new and existing knowledge and experiences on how rural communities can better increase their capacity to make and implement adaptation decisions.
- PELLETTime
 - PELLETTime is an European programme to identify and develop tools that support sustainable local pellet supply chains through the use of local renewable energy resources.



UHI energy & environment projects

- Supergen (Marine Energy Consortium)
 - Part of Phase 2 to increase knowledge and understanding of device-sea interactions of energy converters from model scale in the laboratory to full size in the open sea.
- MaREE
 - Marine Renewable Energy and the Environment, a project focussed on environmental issues surrounding the development of marine renewable energy and the socio-economic impacts of such technologies.
- Equimar
 - Equitable testing and evaluation of marine energy extraction devices in terms of Performance, Cost and Environmental Impacts
- Marine Scotland Research
 - Commissioned research projects on the environmental impacts of marine energy technologies.



UHI energy & environment projects (2)

- AMRECS
 - Advancing Marine Renewable Energy Research Capacity in Scotland, a SRDG grant funded programme to develop a centre of excellence for marine renewable energy research.
- MREDS
 - Marine Renewable Energy Development in Scotland, established as a research engagement and co-operation vehicle for a range of stakeholders in Scottish marine renewable energy.
- Master of Science by Research (MSc)
 - 6 UHI partner collaboration; MSc by research into marine energy and the environment.
- CoastAdapt
 - NPP project aimed to safeguard people living in North Atlantic coastal communities and help them adapt to the impacts of climate change.



UHI Energy management projects

- Greenspace Research
 - Greenspace is the name of an energy research programme at Lews Castle College investigating energy in the built environment/energy dynamics.
- SUSPLAN (PLANning for SUStainability)
 - This focuses on developing regional and pan-european strategies, recommendations, and benchmarks for the integration of renewable energy sources (RES) into future european infrastructures by 2030-2050.



- NPP programme lead by Centre for Mountain Studies on bringing together new and existing knowledge and experiences on how rural communities can better increase their capacity to make and implement adaptation decisions.
- Has four general themes
 - Sustainable transport
 - Sustainable energy management
 - Tourism opportunities
 - Risk Management and response
- Projects currently under way include
 - wood fuel capacity building in the national park
 - electric car demonstration for rural community
 - tourism destination management with blue tooth



- PELLETime is a European programme to identify and develop tools that support sustainable local pellet supply chains through the use of local renewable energy resources. The programme has five work packages;
 - Management, coordination and communication
 - Broadening of raw material base
 - Material handling and logistics
 - Pelletising trials and fuel analysis
 - Advisory, consultation and study tours
- The Agronomy Institute is involved in work looking at broadening the raw material base. The project has two field trials - one on Shetland the other on Orkney - testing the potential of forage grasses, cereal for straw, reed canary grass and willow for conversion into pellets for biomass heating systems.
- There are three strands to the project on Orkney and Shetland
- Crop research
- Visual impact assessment
- Biodiversity and the environment

<http://www.pelletime.fi/>



- Part of phase2 Supergen to increase knowledge and understanding of device-sea interactions of energy converters from model scale in the laboratory to full size in the open sea.
- Work themes include;
 - Impacts of marine renewable energy structures on the invasion of biofouling non-native species
 - The impacts of offshore power production; mitigation through habitat provision
 - Close range interactions between marine vertebrates and tidal-stream turbines
 - Offshore renewable energy structures as artificial islands; implications for dispersal, population connectivity and biogeography of coastal species
 - An integrated modelling framework for EIA of large-scale arrays
 - Radar as a tool for investigating wave-current interaction at marine energy sites
 - Ecological impacts associated with renewable energy devices in extreme marine environments
 - Tidal energy and the matching of supply and demand over the UK grid
 - Examining strategies for maximising use of marine energy



- Focussed on environmental issues surrounding the development of marine renewable energy and the socio-economic impacts of such technologies.
- Three research work package themes;
 - Resource and Risk
 - Tidal resource assessment
 - Wave climate assessment
 - Modelling device-environment physical interaction (including turbulence and array effect)
 - Weather Windowing
 - Environmental Impacts
 - Ecology study design
 - Marine acoustics and interaction of marine mammals and fish with devices
 - Currents, sediments and associated ecological change
 - Marine aggregation/disaggregation by accident/design
 - Seabird interaction
 - Visual observations of benthic and pelagic communities
 - Towards Sustainable Management - policies and communities
 - Marine policy/spatial planning
 - Sustainable Development
 - Community engagement



- Commissioned research projects on the environmental impacts of marine energy technologies.
 - **Collision risks of harbour porpoises:** estimates of collision risk of harbour porpoises and marine renewable devices at sites of high tidal stream energy
 - **Acoustic devices to warn marine mammals:** the use of acoustic devices to warn marine mammals of tidal stream renewable devices





- In summary –
 - Government targets provide sufficient drive and direction
 - Numerous ‘vehicles’ on the road
 - We can’t afford to ease off on the gas as it’s a long journey



Acknowledgements

- Our academic partners:
 - Argyll College UHI
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 - North Highland College UHI
 - Orkney College UHI
 - Perth College UHI
 - Sabhal Mòr Ostaig UHI
 - Scottish Association for Marine Science UHI
 - Shetland College UHI



Any questions?

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