Internet Appendix A14: Strategy

Figure A14.1 Illustrative Pitch Template

Pitcher's Name	**Paul Newbury (9/11/14)**
(A) Working Title	Expediting the transition to low-carbon electric power systems in developing economies: A comparative study of China and India using a Sectoral Systems of Innovation (SSI) framework approach.
(B) Basic Research Question	*1.* Compare and contrast the evolution of the electricity industry in China and India with emphasis on the interplay between 4 key pillars: 1) technology & knowledge; 2) actors and networks; 3) institutions; and 4) demand. 2. To what extent have recent advances and innovations in electricity generation, storage, distribution and energy efficiency technologies impacted and influenced the evolution of the electric power industry in China and India as both countries seek to expedite the delivery of safe, reliable and reasonably priced electricity to all citizens? 3. What institutional structures, policies and regulatory mechanisms are in place or proposed to ensure economic development priorities are appropriately balanced with the need for environmentally sustainable low carbon electricity systems? 4. With China being further advanced than India in the planning and implementation of national electrification programs, what lessons, if any, can India apply from the Chinese experience?
(C) Key paper(s)	Malerba, F. (2002), 'Sectoral systems of innovation and production,' *Research Policy*, 31, 247–264. Malerba, F., and Mani, S. (2009). '*Sectoral Systems of Innovation and Production in Developing Countries: Actors, Structure and Evolution'. Edward Elgar: Northampton, MA, USA* Ockwell, D. G., Watson, J., MacKerron, G., Pal, P., & Yamin, F. (2008). Key policy considerations for facilitating low carbon technology transfer to developing countries. *Energy Policy*, *36*(11), 4104-4115. IPCC (2014) 'Climate Change 2014: *Impacts, Adaptation, and Vulnerability' Available: http://www.ipcc.ch/report/ar5/wg2/ (Downloaded 2 November 2014)*.
(D) Motivation/Puzzle	China (1.357 billion) and India (1.252 billion) jointly comprise 36.6% of the world's 7,124 billion population (World Bank, 2014). Both countries are driving substantial electricity infrastructure investment programs which underpin structural and economic reforms and the modernisation of industrial production capacity. Presently 100% of the Chinese population and 75% of Indian population (i.e. 25% or 309 million without) have access to electricity albeit the per capital consumption of electricity is very low (China: 3.48 MWh; India: 0.76 MWh) in comparison to Western developed economies like Australia (10.22 MWh) and the United States (12.95 MWh). Whilst emissions per capita are currently very low in China (6.8 t) and India (1.58 t), increasing incomes and industrialisation are expected to drive greater electricity consumption and associated emissions. The challenge for China and India is to increase electricity access and consumption whilst limiting carbon emissions to a sustainable level. The extent of this challenge and the associated risks can be better understood if we consider what the quantum of carbon emissions might be if China and India where to have the same emissions intensity as Australia (16.7 t per capita). In such a scenario global carbon emissions would rise from 31,734 Mt to 64,785 Mt, which represents a rise of approximately 104% (World Bank, 2014). In such circumstances the likelihood and extent of global climate change impacts would be greatly increased. In essence, China and India must decarbonise their electric power systems in order to avoid the global climate change impacts predicted by the IPCC.

THREE	**Three** core aspects of any empirical research project i.e. the "**ID**io**T**s" guide
(E) Idea?	If developing world economies like China, India and others adopt similar high carbon emission producing electric power systems, similar to those which exist in Australia and many other Western developed economies, there is an increased risk of serious climate change impacts on a global scale. Therefore, the state managed expansion of electric power systems across such countries must implement policies and regulatory mechanisms to ensure an appropriate balance between the desire for economic and social reform and the need for environmentally sustainable low-carbon energy solutions.
(F) Data?	The electricity sector of each sample country (India and China) constitutes the 'unit of analysis' while the 'unit of observation' for this study will be the key government policy makers and regulatory institutions. This accords to the 'multi case embedded design' approach described in Yin (2009, p.46). This approach involves a detailed analysis of the sector in the first instance before seeking to understand the sector from the viewpoint of key policy and regulatory institutions at the centre of efforts to influence the evolution of the electricity industry. Interviews will be conducted with a range of actors including traditional incumbent electricity industry participants (generation, transmission, distribution and retail) as well as new entrants and energy service firms associated with the deployment of new electricity generation, storage and supply technologies. Interviews will also be undertaken with key the relevant planning and reform commissions, policy makers, energy regulators, industry associations and consumer groups for the purpose of understanding the changing institutional landscape, within the context of the SSI framework. In addition to interview data a comprehensive range of archival documents will also need to be collected (and triangulated) across a variety of actors and networks, study participants and also from publically available sources.
(G) Tools?	*Empirical Frame & Research Design:* A case study approach will be applied with data being collected and analysed for two (2) cases, namely the electricity supply industry in China and India which for the purpose of this research are conceptualised as Sectoral Systems of Innovation (SSI). The SSI approach draws on evolutionary economic theory and innovation systems literature and seeks to understand the evolutionary drivers and trajectory for a given sector or industry based on an examination of the interplay between four core sectoral building blocks: 1) technology and knowledge; 2) actors and networks; 3) institutional frameworks; and 4) demand. *Data Collection Instruments:* Semi-structured interviews with key informants will be used to elicit comments about the evolution in sectoral boundaries. The interview questions will ultimately seek to gather sufficient, relevant and reliable information to address the specific research questions.
TWO	**Two** key questions
(H) What's New?	The SSI literature has traditionally been used to examine industries in Western developed economies, with an overriding bias towards industries in competitive markets where established institutional frameworks and structures exist. This contrasts greatly with the proposed study of an industry under development within countries who are undergoing considerable economic, social and cultural reforms. The interplay between the core SSI elements of technology, stakeholders, demand and institutions will drive the evolution of sectoral boundaries and influence the success or otherwise of the reform agenda being pursued in these countries. Unlike the evolution of the electricity sector in developed countries which have been heavily shaped by market forces, state policy making and regulatory institutions in developing economies must play a leading role in driving outcomes that meet environmental sustainability imperatives.
(I) So What?	In simple terms, if India, China and other highly populated developing economies were to replicate the electricity industry structures and institutional frameworks of Western developed economies such as Australia, then there would be no reasonable prospect of achieving the quantum of global carbon emissions reductions needed to prevent or minimise the anticipated climate change impacts projected by the IPCC.
ONE	**One** bottom line
(J) Contribution?	The study expands our understanding of the dynamic interplay between technological regimes, actors and networks, demand and institutions and how these combine to impact the patterns of innovation activities and changing boundaries of a sectoral system of innovation. Furthermore, the research demonstrates how the SSI approach can also be applied as an effective tool in nascent markets, emerging economies and industries where sectoral boundaries and institutional frameworks are not yet established and working effectively. From a practical viewpoint, the research demonstrates how the SSI approach can aide policy development to drive desirable outcomes for key stakeholder groups including industry participants, investors, consumers and governments.
(K) Other Considerations	A key strength of this research proposal is that is has strong international interest and support from representatives within the World Bank, Indian & Chinese governments, and leading research institutions including University of Queensland, University of Cambridge, University of Oxford, Stanford University, Harvard-Kennedy School of Government, MIT, INSEAD, TERI University and Tsinghua University. In this regard, I have been approached by the Australia-India Business Council who has offered to act as an intermediary to establish key links with India industry, government and academia. The World Bank has also offered to host the lead researcher in their Washington office to aide development of a more detailed research proposal.