TRANSITIONING TO SUSTAINABILITY IN SASKATCHEWAN POWER PRODUCTION[1]

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Abstract

This paper hypothesizes the future of Saskatchewan power production based on the theory of transition management. Power generation law and policy in Saskatchewan over the last century to the present is analyzed as a key component of a socio-technical regime. Understanding the legacy of law and policy is important given sustainability concerns and the realization that significant changes will be required in trajectories of development putting less strain on natural capital and ecosystem services.

This paper examines the critical relationship between governance strategies at the macro socio and political landscape level and the particular policy mix that is found in the socio-technical regime of power generation in Saskatchewan. This exercise is informed by transition management theory and also the alternative explanations of path dependency. Switch points critical to the trajectory of power generation development are identified and used to illustrate and assess the plausibility of these theoretical concepts. Current landscape developments in Saskatchewan, including the emergence of concerns for human-induced climate change, the development of wind power and even the re-emergence of nuclear power generation as a policy option, may facilitate a transition towards greater sustainability. These sustainability paths are juxtaposed against the development of Saskatchewan's oil sands and the development of carbon capture sequestration technology. Possible future alternative pathways to sustainable power production are outlined and critiqued in the current Saskatchewan governance context.

Keywords: transition management, power generation, sustainability.

1 INTRODUCTION

This paper focuses on transitioning (or change) in power production and the challenge of transitioning to sustainable power production. Sustainability in this context does not mean the continuance of the current actors such as SaskPower, or sustainability of the current technology employed, or the sustainability of Saskatchewan's current energy sources, wind, coal etc. Sustainability means making decisions about the environment ensuring its preservation for future generations (Redclift et al., 1997). Power generation

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and supply has become a key focus for sustainability given its contributions to greenhouse gas emissions and global and national climate change. Saskatchewan is a prime case study given its vertical and horizontal effective monopoly actor, SaskPower which simplifies the identification of government policy and power production decision points.

Path dependency is an approach to policy development which recognizes that the adoption of a particular technology is followed by significant investment. As such an initial decision or "switch point" creates positive feedback which supports further refinements of the same technology at new switch points. The accumulation of sunk costs makes it increasingly difficult to diverge from this path or reopen the initial decision, however suboptimal the outcomes may seem to be in comparison with competing technologies. These initial switch points and the following constrained decision making in future policy choices recreates and perpetuates the technology initially chosen and thus creates an entrenched socio-technical regime (Howlett, 2006; Haydu, 1998).

While path dependency explains continuity, a new understanding of change was required in institutional development seeking to develop strategies to switch pathways as the sustainability agenda requires. Transition management emerged focusing on the problems of changing socio-technical regimes by connecting the older focus on technological trajectories supported by shared ideas and practices in science and engineering communities with the later concerns of sociologists of science and

technology about the stabilization of technological development by the interaction of scientists, policy-makers, end-users and activists (Geels and Schot, 2007).

Transitions are explained in this theory as occurring through an alignment of developments between three levels: socio-technical landscapes, socio-technical regimes and niche innovations as illustrated in Figure 1. Socio-technical landscapes are macro-level arrangements that provide the exogenous policy context concerning social rules and norms. At the landscape level change is slow and incremental but can still often place downward pressure on socio technical regimes. At the regime level established communities of experts (engineers, scientist), along with policy makers and interest groups contribute to the alignment of specific goals that temper technological development patterns. Niche-innovations must break into an existing social technical regime through process of learning, performance improvement or support from influential actors. While the types of transition vary based on timing and the nature of the interactions, the theory can be used to trace specific trajectory of institutional development and identify destabilizing conditions (Rip and Kemp, 1998).

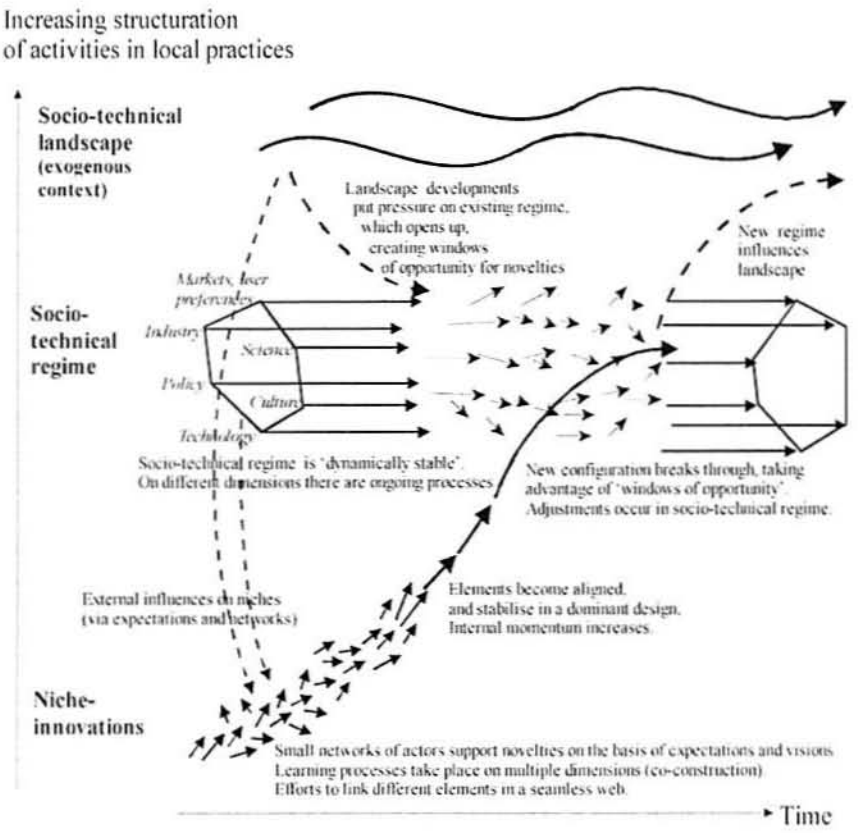

Figure 1. From Geels and Schot (2007: 401)

This paper relies on a version of the theory which includes both exogenous (landscape level and niche level) and endogenous change (regulatory and policy) changes. Transition management recognizes the exogenous changes create a window of opportunity for moving away from a particular trajectory of problem solving and creating a more sustainable socio-technical regime. Transition management is thus both a governance strategy and a theory of change (Kemp and Rotmans, 2005). To explain trajectories, transition management focuses on the changing relationships between the socio-technical regime and other two levels of the model, landscape and niche. Four possible alternatives of change exist. In addition to the null option or *reproduction* of the existing regime, two possible transition trajectories could occur: *transformation* wherein gradual adjustments in regime actors and institutions create an environment more

conducive to technical innovation complementary to the existing technologies or *replacement* if actors resist change or landscape pressure becomes more disruptive. If innovations are not sufficiently developed the result may be a lengthy period of experimentation and an eventual *dealignment and realignment* in which a radically different configuration of actors, institutions and ideas emerges.

2 POWER PRODUCTION IN SASKATCHEWAN

An analysis of power production in Saskatchewan over the past century shows three significant switch points:

2.1 Saskatchewan Power Resource Commission

A significant switch point occurred in 1929 with the creation of a commission mandated to acquire and publicly own power generation and integrate it with a Saskatchewan transmission system. Landscape changes included the rise of cooperatives and public ownership in Saskatchewan, the lack of a federal government presence in power generation and the continual development of technology (White, 1976; Rediger, 2004). Because of its far reaching transition this period is characterized as one of *dealignment* and realignment.

2.2 The Emergence of Lignite Coal

In the 1970s lignite coal power generation emerged as the dominant power source in Saskatchewan. One thousand five hundred thirty one MWs of lignite coal power production was added to Saskatchewan's generation mix. Two endogenous developments contributed: the availability of capital and the Saskatchewan culture for

supporting the government provisions of services (White, 1976; Rediger, 2004). Because a new technology replaced the current technology this period is characterized as one of *replacement*.

2.3 The Abandonment of Coal

In 1994 lignite coal ceased to be a feasible generation option due to increased environmental concerns, the potential for more stringent federal laws and regulations, increased public consultation and review of decisions, concerns over government deficits as well as lack of available funds and the deregulation of electricity in North America. This third switch point is characterized as one of *transformation* in which a gentle transition to more sustainable technologies has been embraced (see Hurlbert, McNutt, and Rayner, 2010).

3 FUTURE PATHWAYS

In the future SaskPower is embarking on a continuation of its transformation through embracement of green technologies in power production including wind and the cleaner alternative to coal, natural gas. Options of clean coal with carbon capture and sequestration, nuclear, hydro and renewable sources of power generation all remain listed as future options (SaskPower, 2009a, SaskPower, 2009b). External pressure from landscape level or outsider social groups continues and gradual adjustment and reorientation of the existing power production regime occurs. SaskPower, as the dominant regime actor, continues to reorient existing development trajectories on a modest changed path of emission reductions.

It is highly unlikely that *reproduction,* or the continuation of the existing make up of power generation sources including coal will continue. The federal government announced its intention to pass regulations to phase out coal-fired plants that have reached the end of their economic life by requiring more stringent standards. These regulations would come into effect in 2015 (Environment Canada, 2010). Other pathways are possible.

A combination of socio-technical landscape development and niche technology innovation (nuclear power generation) potentially open a window of opportunity for a *replacement* path of power production regime in Saskatchewan. The adoption of this technology would necessitate radical transformation of the socio-technical regime itself with new actors, a new regulatory context, new research and ideas. Old institutions and actors would disappear. Issues of waste disposal, the resource commitments necessary to integrate nuclear into the grid, safety concerns, thermal pollution, public costs, potential population health impacts and lack of public confidence are all obstacles to provincial nuclear development (Harding, 2007). In addition, as nuclear energy is a matter within the jurisdiction of the federal government, the provincial electricity provider, SaskPower would have to transform its current network of accountability and actors with which it interacts. Recent overtures of the acceptability and possibility of nuclear power generation have been made by SaskPower (Johnstone, 2010). At this time, this path still cannot be embraced with certainty. Although the *replacement* path, or that of technological substitution, has been rejected by one analysis of the electricity sector

(Verbong and Geels, (2007), this paper's authors argue that for the purposes of the scale of Saskatchewan electricity, in the province of Saskatchewan, the possibility of nuclear power generation makes this option available.

Another possible future path is that of *dealignment and realignment*. If innovations are unavailable to address landscape pressure a lengthy period of experimentation may ensue in which several technologies exist side by side until one option eventually becomes dominant. Perhaps this can be seen with the continued mutual development of wind and natural gas. Both of these have been proceeding side by side for several years; perhaps one will emerge as dominant, or perhaps another technology will. Extraneous pressures of robust environmental regimes surrounding carbon emissions or success of developing technology such as clean coal may cause this *dealignment and realignment*. Currently Saskatchewan is heavily involved in carbon capture and storage technology. SaskPower is developing a full-scale demonstration project at one of its coal fired plants at a cost of 1.4 billion (Government of Canada, nd). A joint project with Montana is being explored through a memorandum of understanding which would involve the construction of a new, commercial-scale CO2 capture reference plant at one of SaskPower's coal-fired power plants with the CO2 captured stored in Montana. The reference plant would test a range of post-combustion capture technologies (Tontiwachwuthikul, 2009).

4 CONCLUSION

This paper has critiqued the history of power production in Saskatchewan utilizing the theory of transition management. By illustrating major switch points of change in the

socio-technical regime of power production in Saskatchewan significant drivers and leadership can be identified for pursuing sustainable power production. This same theory can be utilized for developing a strategy of future power production decisions by identifying possible alternative pathways and predicting future exogenous factors and niche technological innovations. Like all models the end result and usefulness is only so good as the quality of the information input.

In Saskatchewan reproduction of the existing socio-technical regime relying significantly on lignite coal and its current technology is highly unlikely. However the development of clean coal with carbon capture and sequestration may enable a significant dealignment and realignment from the current transformative pathway of natural gas and wind. Given current social factors, a replacement path to nuclear technology is also a potential.

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