What can India learn from China's not-so-successful progress towards electric mobility?

Zheng Wan, Yang Chen and Yunshi Wang

India released its comprehensive National Electric Mobility Mission Plan (NEMMP2020) in 2013 with the ambition to deploy 5 to 7 million hybrid and electric vehicles (xEVs) by 2020 (ref. 1). The large-scale use of xEVs in India could mean a decrease in fuel oil importation and mitigation of pollution caused by the transportation industry[2]. In addition, the technological advantage presented by the manufacture of EVs is expected to be a new economic growth highlight for India. However, administrative policies such as NEMMP2020 do not automatically constitute a consolidated business model.

India is not the only country with a vision to deploy xEVs on a large scale; its neighbour China has proposed similar plans and roadmaps in the past few years. However, the ambition to build a competitive EV industry and market is not being realized as hoped in China. In interviews held by Deloitte with consumers from 17 countries in 2011, those from China accounted for 93% of the respondents who expressed willingness to purchase EVs[3]. However, willingness does not necessarily reflect actual purchase behaviours. xEV sales was only 17,500 and 17,600 in 2012 and 2013 respectively, or less than 0.1% of total civilian vehicle sales in both years, which failed to meet China's xEV development targets[4].

Some recent studies[4–6] provide answers and list many hurdles facing the xEV industry, including high vehicle cost, lower-than-expected battery performance, inadequate basic infrastructure, lack of models to choose from, and safety concerns. However, we think that some inherent conflict among the various objectives to develop xEVs in China is also responsible for the situation and this can largely explain why strong consumer and industry resistance exists in China.

There are four objectives that motivate the central and local governments to promote xEVs in China.

- Energy security[7], to cap China's oil import dependency at around 60%, a target set to mirror the US peak oil dependency, which it reached in 2006.
- Industrial policy[8], to leapfrog established international automakers because China feels that the EV industry presents an opportunity to compete with them.
- Economic transition[9], from one that is anchored on labour-intensive industries to one that is based on high value-added, high-technology manufacturing.
- Environmental landscape[10], with record-high air pollution levels observed in China in recent years, and vehicle emissions confirmed as one of the primary contributors to nationwide smog pollution.

However, conflict among these objectives has impeded the overall development of xEVs. For example, Chinese decision-makers de-emphasized plug-in hybrid electric vehicles (PHEV) early on, partly because they believed that Japanese automakers had monopoly over hybrid technologies. Hybrid technologies can play an important role in a nascent EV industry in which charging infrastructure is sporadic or non-existent[11]. If reduction of oil consumption and clean air are paramount goals, then PHEVs can improve the efficiency of light-duty vehicles and reduce emissions at a low cost and in a short-time range. However, since they are now mass-produced by Toyota and other foreign manufacturers, PHEVs no longer provide an opportunity for leapfrogging.

Industry resistance also comes from the real environmental impact on the use of EVs. China's 12th Five-Year Plan (2011–2015) indicates that renewable forms of energy should account for 11% of the country's total energy supply. In particular, the use of nuclear power will be increased by around four times to 40 GW, hydro power from 230 to 290 GW, and wind power from 75 to 100 GW. However, use of coal is still expected to grow by 260 to 933 GW. Abundant and cheap domestic coal will continue to power majority of plants across the country, and this essentially means that the environmental benefits derived from the EV industry would be heavily negated based on life-cycle analysis of greenhouse gas emissions[12]. Lobbyists working for influential automakers have utilized this as a moral high ground to criticize the existing subsidy policies for EVs. They believe that better alternatives exist: Why not focus instead on improving the efficiency of the internal combustion engine? Why not subsidize oil refineries so that fuel standards are considerably improved? Why not set more strict emission standards for conventional cars? The use of existing technologies could be more efficient and thus achieve more significant energy saving and pollution reduction than the use of EVs.

Automakers make business decisions based on return on capital. It takes them years of product development and huge investments to change concepts on paper to a market-ready EV model. Leading conventional auto manufactures in China are confronted with an emerging dilemma: their EV competitors, such as Tesla or BYD, are using strategies that may conflict with their own. Should conventional auto manufactures resolve this problem by adopting the strategies of their competitors, and thereby run the risk of damaging their existing business and undermining their existing strategies?

A currently popular practice among Chinese car manufacturers is to incorporate EV innovation by establishing a separate organizational unit for this purpose (e.g. EV R&D unit). Nevertheless, the lack of decision-making autonomy in the new unit has contributed to poor synergy between the EV unit and the parent company's traditional car business. The corporate culture of conventional auto manufactures simply does not allow them to take the risk of deviating from the past to truly innovate in the EV sector.

Carrot-and-stick approaches do exist, but they have not motivated the auto manufactures to switch to xEVs as expected. China's 2015 fuel economy standard requires fleet-average target of 6.9 litres/100 km, which is only a moderate improvement over the base 2010 level of 7.7 litres/100 km. The proposed 2020 target of 5 litres/100 km is not very

far off, and compliance with China's 2020 target does not require participation of xEVs given that much smaller and lower-performance vehicles are included in the Chinese fleet[13].

Apart from the subsidies provided directly to the consumers, Chinese xEV manufactures are not given bonuses for each vehicle they sell; unlike their US counterpart Tesla, they do not enjoy any special tax treatment or earn credits by making and selling zero emission vehicles. Conventional carmakers in China thus have a weaker incentive to go fully green, while established EV manufactures are less inclined to innovate compared to their US counterpart[14].

For the emerging EV industry, the innovation and policy diffusion process also seems slow and difficult. Diffusion barely exists in middle and small-sized cities, in which abundant and cheap lands are available for infrastructure deployment and the average commute distance is much smaller. This means that potential EV buyers in middle and small-sized cities could not receive any subsidy during the past few years. No sales translates into zero commitment to deploying charging facilities, and no EV dealers exist in hundreds of middle and small-sized cities. Thus, a huge potential EV market has remained unexploited. As indicated by our previous study[15], small and medium-sized cities in China lack talented workforce and feasible schemes for planning and management of utilities. The 'investment-valued, management-despised' approach of the Chinese auto market can seriously undermine EV diffusion unless direct interference or administrative orders from upper-level governmental agencies are passed down (i.e. vertical diffusion).

Right now, the xEV industries of both India and China are still at infancy with weak regulatory systems. Most automakers still do not have a long-term incentive to engage in xEV production for the private market due to all the uncertainties cited earlier in this note. Both countries will need a broader set of policies and strategies to overcome consumer and industry resistance.

1. Department of Heavy Industry, Government of India, National Electric Mobility Mission Plan 2020; http://dhi.nic.in/NEMMP2020.pdf (accessed on 20 September 2014).
2. Banerjee, P. K., Chaudhari, M., Salunkhe, U. and Ravishankar, S., Opportunities and control measures for sustainable transport growth in emerging economy regions – India. SAE Technical Paper No. 2013-01-1037, 2013.
3. Deloitte, Deloitte survey: Chinese consumer market strong for electric vehicles. 2011; http://www.deloitte.com/view/en_CN/cn/Pressroom/pr/5b69306ba7b6f210-VgnVCM1000001a56f00aRCRD.htm# (accessed on 20 September 2014).
4. Wan, Z., Daniel, S. and Wang, Y., *Trans. Res. Part D*, 2014 (in press); doi:10.1016/j.trd.2014.10.014.
5. Zheng, J., Mehndiratta, S., Guo, J. Y. and Liu, Z., *Transp. Policy*, 2012, **9**(1), 7–25.
6. Sathaye, N. and Kelley, S., *Transp. Res., Part E: Logist. Trans. Rev.*, 2013, **59**, 15–33.
7. Wan, Z. and Craig, B., *Utilities Policy*, 2013, **27**, 93–97.
8. Wang, H. and Kimble, C., *Int. J. Automot. Technol. Manage.*, 2011, **11**(4), 312–325.
9. Wan, Z., Zhang, Y., Wang, X. and Chen, J., *J. Transp. Geogr.*, 2014, **34**, 1–6.
10. Hu, D. and Jiang, J., *J. Environ. Prot.*, 2013, **4**(7), 746–752.
11. Qian, L. and Soopramanien, D., *Trans. Res. Part D: Trans. Environ.*, 2011, **16**(8), 607–613.
12. Hawkins, T. R., Singh, B., Majeau-Bettez, G. and Strømman, A. H., *J. Ind. Ecol.*, 2013, **17**(1), 53–64.
13. He, H. and Bandivadekar, A., Passenger car fuel-efficiency, The International Council on Clean Transportation, Working paper 2013-3, 2013.
14. China Business News, BYD increases the share of traditional automotive business, 2011; http://news.cheshi.com/fenxi/201105/334091.shtml (accessed on 20 September 2014).
15. Wan, Z., Wang, X. and Sperling, D., *Utilities Policy*, 2013, **27**, 1–8.

Zheng Wan and Yang Chen are in the College of Transport and Communications, Shanghai Maritime University, Shanghai 201306, China; Zheng Wan and Yunshi Wang are in the Institute of Transportation Studies, University of California, Davis, CA 95616, USA; Yang Chen is also in Harvard Business School, Harvard University, Boston, MA 02136, USA. *e-mail: mrwan@ucdavis.edu*