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TIME-OF-USE PRICING COULD HELP CHINA MANAGE DEMAND

by Emmett Pepper*

Time-based pricing policies can efficiently address rising energy consumption by offering incentives to minimize electricity demand spikes during peak usage.¹ With China's urban population predicted to surpass its rural population in 2015 and to be nearly double the rural population by 2030, there is a growing need for solutions to meet urban electricity demand.² As China's middle class continues to grow, it will likely cause additional stress on electricity grids with the increase in use of air conditioning and other electrical appliances.³ If China implements a real time pricing model soon it could create a regulatory scheme that avoids the problems Western countries encountered in their attempts to manage demand through time-based pricing.

"Demand-side management" ("DSM") includes policies aimed at reducing electricity usage, including conservation-oriented efforts such as consumer education campaigns and light bulb trade-in programs, as well as an array of systems categorized as "smart grid," which utilize electricity usage information to manage demand.⁴ Two types of smart grid development, time of use ("TOU") pricing and real time pricing ("RTP"), both charge consumers more during the times of day (and year) with the highest electricity use and when the grid is most taxed, but have different pricing mechanisms.⁵ RTP changes the price charged to consumers, hour-by-hour, based on the wholesale price of electricity at the moment it is being used; TOU pricing establishes graduated electricity rates for blocks of time.⁶ TOU is more commonly used for residential customers because of its simpler structure.⁷ Establishing TOU pricing in China can directly address the problems caused by peak demand, especially if used in tandem with efforts to meet demand like modernizing the electricity grid, increasing electricity generation, and adopting conservation programs.⁸

China may still face problems from insufficient supply during peak electricity use even though it is working to upgrade its grid and increase production.⁹ Blackouts and brownouts occur when electricity demand outstrips supply, often leading governments to rely on pollution-spewing generators and other power plants or "load shedding" (planned blackouts).¹⁰ In China, this occurs because poor transmission lines "leak" electricity from power plants located many miles from large urban areas where much of the electricity is consumed.¹¹ Policymakers in China should integrate TOU policies into new developments to avoid the extreme peaks of growing middle class electricity use, which will persist despite having a modern grid.¹²

China has started implementing time-based demand reduction strategies to help meet electricity demand, but is only in the early stages of doing so. Since 1996, after determining that industrial users consumed at least half of electricity during peak

periods, the Beijing electric utility implemented TOU pricing and other demand incentives to encourage industrial electricity users to shift to off-peak periods.¹³ Shanghai has made the most significant strides in residential TOU pricing, and since 2001 has given a fifty percent discount at night to residential customers who purchase a TOU-capable meter.¹⁴ The Beijing and Shanghai programs have seen some success, but the number of consumers who voluntarily sign up for the programs limits their impact.¹⁵

Examining existing time-based pricing programs in the West can guide policymakers in China seeking to establish effective and equitable pricing structures. For example, in early 2010, Ontario, Canada's utility began requiring residential consumers to install a TOU meter.¹⁶ Prices rose significantly, partly due to the TOU pricing, but also due to an especially hot summer, causing a public backlash against TOU pricing.¹⁷ Three criticisms emerged about the Canadian program: 1) that TOU raised rates across the board, even for those who shifted some electricity use to off-peak times, 2) that TOU had a disproportionate impact on the poor, and 3) that TOU is ineffective in reducing peak demand.¹⁸ Ontario's problems with its TOU program may be due to the fact that, compared to the non-TOU rates, the off-peak savings (eighteen percent) are less than the increase during the "mid-peak" and "on-peak" hours (twenty-three to thirty-seven percent),¹⁹ which is less significant than other TOU discounts.²⁰

A recent Chinese guidance document may help China avoid Ontario's problems.²¹ The suggested graduated tariff price system estimates that seventy to eighty percent of residents will be unaffected by the increase; only top electricity users will see an increase in their electricity bills.²² Since the poor use little electricity, the policy will reduce the impact of all rate changes on the poor, including TOU rates.²³ Implementation of the guidance policy will encourage conservation and create an equitable regulatory framework for TOU implementation.

To maintain energy reliability while continuing double-digit economic growth, China should implement mandatory TOU pricing models immediately, particularly in the coastal cities far from electricity generation. China should structure the rates equitably to exempt the poor from price increases but make the peak price difference high enough to have a meaningful impact on wealthier, high-energy users, causing them to change electricity use behavior.

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¹ BARBARA FINAMORE, ET AL., NATURAL RES. DEF. COUNCIL, DEMAND-SIDE MANAGEMENT IN CHINA 4 (2003), www.nrdc.org/air/energy/chinadocs/dsm.pdf.

² Xinhua News, *China Leads the World in Urbanization: Blue Paper*, CHINA DAILY (July 30, 2010), http://www.chinadaily.com.cn/china/2010-07/30/content_11069784.htm.

³ FINAMORE, *supra* note 1, at 51; JAMES H. WILLIAMS & FREDRICH KAHRL, *Electricity Reform and Sustainable Development in China*, 3 ENVTL. RES. LETTERS 044009, 8 (2008), http://iopscience.iop.org/1748-9326/3/4/044009/pdf/1748-9326_3_4_044009.pdf.

⁴ FINAMORE, *supra* note 1, at 4-5.

⁵ FED. ENERGY REG. COMM'N, DOCKET NO. AD-06-2-00, ASSESSMENT OF DEMAND RESPONSE & ADVANCED METERING 51-57 (2006); Junqiao Han & Mary Ann Piette, Earnest Orlando Lawrence Berkley Nat'l Lab., *Solutions for Summer Electric Power Shortages: Demand Response and its Applications in Air Conditioning and Refrigeration Systems*, REFRIGERATION, AIR CONDITIONING, & ELECTRIC POWER MACHINERY, Jan. 2008 § 3.2, <http://drrc.lbl.gov/pubs/63806.pdf>.

⁶ FED. ENERGY REG. COMM'N, *supra* note 5, at 51-57.

⁷ *Id.* at 54.

⁸ FINAMORE, *supra* note 1, at iv (advocating for energy efficiency to address power shortages).

⁹ Patrick McGeehan & Fernanda Santos, *New York Wilts Under Record-Breaking Heat Wave*, N.Y. TIMES, July 6, 2010, at A1 (describing power failures in 2010 in Staten Island, N.Y., New Jersey, and in 2006, Queens, N.Y.); *see also* KEVIN LIU, CHINA ENV'T FORUM, WOODROW WILSON INT'L CTR. FOR SCHOLARS, WISING UP: SMART GRID AS NEW OPENING FOR U.S. CHINA ENERGY COOPERATION (2009), http://www.wilsoncenter.org/topics/docs/wising_up1.pdf.

¹⁰ LIU, *supra* note 9.

¹¹ *Id.*

¹² *Id.*

¹³ FINAMORE, *supra* note 1, at 19-20.

¹⁴ *Graduated Tariffs Feature in Energy Price Reform*, SHANGHAI DAILY, Oct. 10, 2010, <http://english.eastday.com/e/101010/u1a5485791.html>; FINAMORE, *supra* note 1, at 22.

¹⁵ FINAMORE, *supra* note 1, at 19-20.

¹⁶ Karen Howlett, *Ontario Hydro's Smart Meters Give Dumb Results: Critics*, THE GLOBE AND MAIL, Sept. 14, 2010, <http://www.bradfordtimes.ca/ArticleDisplay.aspx?e=2708342>; Miriam King, "Perfect Storm" Hits Ontario Hydro Users, BRADFORD-WEST GILLIMBURY TIMES, <http://www.bradfordtimes.ca/ArticleDisplay.aspx?e=2708342> (last visited Nov. 7, 2010).

¹⁷ See Howlett, *supra* note 16; King, *supra* note 16.

¹⁸ Ted Kendell, Letter to the Editor, *My Bill's Still Rising*, THE OTTAWA CITIZEN, Sept. 28, 2010, <http://www.ottawacitizen.com/news/bill+still+rising/3588684/story.html> (shifting 70% of energy use still resulted in higher bills); Randy Richmond, *Ontario Residents Brace for Power Bill Hike*, CNEWS, <http://cnews.canoe.ca/CNEWS/Canada/2010/07/29/14862356.html> (last visited Nov. 7, 2010) (explaining that low-income and elderly will not be able to offset their energy use to compensate for increases); Lee Greenberg, *Ontario May Adjust a Time-Of-Use Power Use, McGinty Says*, OTTAWA CITIZEN, Sept. 15, 2010, <http://www.ottawacitizen.com/technology/Ontario+adjust+time+power+McGinty+says/3522557/story.html> (stating that sixty-eight percent of users under TOU have higher bills).

¹⁹ *Ontario Time-of-Use Electricity Rates*, ONTARIO HYDRO, http://www.ontariohydro.com/index.php?page=current_rates (last visited Nov. 2, 2010) (showing an off-peak rate of 5.3 cents/kWh, a mid-peak rate of 8.0 cents/kWh, and an on-peak rate of 9.9 cents/kWh, with normal meter pricing at 6.5 cents/kWh up to 600 kWh/month).

²⁰ *Time of Use Rate*, ORANGE & ROCKLAND, <http://www.oru.com/programsandservices/incentivesandrebates/timeofuse.html> (last visited Nov. 2, 2010) (peak to off-peak difference of approximately 550%); *National Grid Time-of-Use*, MASS ELECTRIC, http://www.nationalgridus.com/Masselectric/home/rates/4_tou.asp (last visited Nov. 2, 2010) (peak to off-peak difference of approximately 600%); *Time-of-Use Billing*, CTR. HUDSON GAS & ELEC., http://www.cenhud.com/residential/time_use.html (last visited Nov. 2, 2010) (peak to off-peak difference of approximately 240%).

²¹ *New Electricity Price Policy has Limited Impact on Commodity Prices*, PEOPLE'S DAILY ONLINE (Oct. 12, 2010), <http://english.peopledaily.com.cn/90001/90778/90862/7163061.html>.

²² *Id.*

²³ *Id.*