

Development Capital

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MR. MARTIN: So you are willing to take risks.

MR. GARDNER: Yes, but we are past the R&D phase. In the case of something like Fulcrum, I would describe it as technology integration or scale-up risk because each of those technologies has been separately proven. Plasma gasification is used regularly to create gas in things like medical wastes. Fischer-Tropsch has been used for decades in South Africa to convert coal to liquid fuel.

MR. MARTIN: Scott Gardner, what is the best way for a developer to get in the door to make his or her case to you?

MR. GARDNER: We have a portal on our web site for people with business plans. We probably would prefer people just to contact us directly and send introductory information without a lot of volume, so we can make a judgment about whether it's a fit. Let me give an example. I am looking at the area of waste heat recovery and industrial efficiency. It is an area that fits our mandate because it is carbon neutral. What we do in a sector like that is form a thesis around what we think is the right technology or the right approach to the business, and then we look for companies that are active in the sector. We often approach them. We are less likely to be turned on by a company who approaches us for money in a sector in which we have not already formed a thesis.

MR. MARTIN: Pat Eilers, what is the best way to get your attention at Madison Dearborn?

MR. EILERS: Go to our website and then just call us.

MR. MARTIN: Ricardo Diaz, same thing at Santander?

MR. DIAZ: We like preliminary information by e-mail, and we follow up by the phone after that. ☺

A New Transmission Superhighway Takes Shape in the West

by David Howarth and Dr. Robert Weisenmiller, with MRW & Associates, LLC in Oakland, California (Ed.: just before publication, Dr. Weisenmiller was appointed to the California Energy Commission and is no longer with MRW.)

A new transmission superhighway is starting to take shape in the west. Generators whose projects are located near the areas served by it will end up winners. More distant projects will be losers, in the same way that businesses along new interstate highways or subway lines prospered.

Pressing Need

New transmission lines will have to be built from the areas where renewable resources are abundant, which are often remote, to the load centers where electricity is consumed for the United States to have any hope of meeting ambitious renewable energy targets.

President Obama called for doubling renewable energy by 2012, a goal that is supported with considerable financial incentives contained in the American Recovery and Reinvestment Act of 2009. Congress has also taken up the issue with legislation that would establish a national renewable energy portfolio standard, or RPS, of 6% by 2012 and 20% by 2020. These targets were included in an energy bill that passed the House last June; the bill is expected to be taken up by the Senate this year.

In some cases, renewable energy projects are so remote that the cost of interconnecting to the transmission system may be prohibitive. As a result, generators may be unwilling to commit to the interconnection process until a transmission line is added and the incremental cost is reduced, while transmission owners may be unwilling or unable to build a line without commitments from generators in the location to be served by the line. This leads to a classic chicken-and-egg dilemma that prevents construction of new transmission lines. Even when a transmission project is economically justified, the planning and siting process can be extremely difficult given the effects on the environment and communities located along the transmission route.

The western states have been pursuing policy initiatives to address these problems.

The California experience, in particular, may hold lessons for

people in other parts of the country.

The initiatives include ways of addressing cost-recovery as well as broad multi-stakeholder planning processes for new transmission lines.

California Experience to Date

California originally required investor-owned utilities to meet an RPS target of 20% by 2017. In 2006, it pushed the 20% target to 2010. In November 2008, Governor Schwarzenegger issued an executive order that increased the target to 33% by 2020 for all load-serving entities, including municipal utilities.

The executive order established a renewable energy action team and called for a streamlining of the renewable energy project siting process. It also directed state agencies to take the RPS into account in all regulatory proceedings, including transmission line permitting.

In 2009, the California legislature codified the 33% RPS target. However, the legislation limited reliance on out-of-state renewable sources, which led to a veto by Governor Schwarzenegger.

Instead the Governor issued another executive order directing the California Air Resources Board — called CARB — to adopt greenhouse gas regulations by July 31, 2010 that are consistent with the 33% renewable target. CARB has broad authority by statute to establish greenhouse gas standards. (See “California Plans a Carbon Diet” in the January 2009 Project Finance Newswire). It is under this authority that the 33% RPS will be implemented in California.

When the California RPS was first established, the state also took steps to support transmission projects necessary to reach the RPS goals.

Any projects deemed necessary by the California Public Utility Commission, or CPUC, to meet the RPS goals automatically meet the need test for the purpose of transmission siting. The CPUC also has authority to permit utilities to recover through retail electricity rates any costs for renewable energy transmission projects approved by the CPUC that the Federal Energy Regulatory Commission does not allow in transmission rates. Procedures for implementing this “backstop” renewable transmission cost recovery policy were formally adopted by the CPUC in June 2006.

California has had some recent success in planning and siting new large-scale transmission projects to serve renewable resource areas, including the Sunrise Powerlink to connect the Imperial Valley to San Diego and the Tehachapi transmission

project north of Los Angeles. Although the planning and siting of these projects has not been easy, the experience with them led to policy and procedural changes that have improved the transmission siting process in California.

At least six other renewable energy transmission projects are currently being pursued in California: the California portion of Devers–Palo Verde 2 (Southern California Edison), the central California clean energy transmission project (Pacific Gas & Electric), the Green Path transmission projects (Los Angeles Department of Water and Power and Imperial Irrigation District), the Lake Elsinore advanced pumped storage and transmission project (Nevada Hydro) and the Canada-Pacific Northwest-Northern California transmission project (Pacific Gas & Electric).

The Sunrise project was initially proposed as a 150-mile 230/500 kv transmission line from the Imperial Valley to San Diego. The project included construction of a new substation and modification of several existing substations. Significantly, the proposed project traversed 25 miles of the Anza-Borrego State Park, including some wilderness areas. After completing a more than 11,000-page environmental impact report to comply with California and federal environmental regulations, and a three-year siting proceeding at the CPUC, the original proposal was denied and an “environmentally-superior southern route” was approved. The approved 123-mile southern route twists around the park and nearby Indian reservations, but still traverses part of the Cleveland National Forest. Some environmental groups, including the Sierra Club and the Center for Biological Diversity, continue to oppose the project and have appealed to the courts to overturn the approval.

The Tehachapi transmission project was innovative in that it was developed as a multi-user trunk line specifically to support remote renewable energy development. However, it, too, had a difficult siting process and the cost increased significantly as portions of the line went from 230 kv to 500 kv to support the addition of renewable energy projects not contemplated in the original transmission design. The initial three segments were approved in 2007 and are currently under construction. In December 2009, the CPUC issued a permit for Southern California Edison to complete the remaining phases of the project. There are still objections to at least one segment that is also likely to be challenged in state court.

The Tehachapi transmission project is being developed using an innovative regulatory scheme. The California Independent System Operator — called CAISO — is authorized by FERC to establish defined energy resource areas / continued page 50

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that would benefit from the establishment of multi-user resource trunk lines. These trunk lines would be eligible for favorable rate treatment, allowing transmission owners to include the costs that are not recovered from generators in their FERC-authorized transmission rates. The CPUC backstop cost recovery is still in place, but given federal approval of tariff-based rate recovery for renewable transmission lines, use of this backstop should not be necessary for Tehachapi.

Allocation of transmission costs to individual projects remains an issue and has been a subject of great controversy in the interconnection process.

Generator interconnection requests have historically been reviewed on a first-come, first-served basis. This approach resulted in cost discrepancies depending on the relative queue position of projects as well as a time-consuming iterative study process that would often need to be repeated when speculative projects dropped out of the queue or when project configurations were altered.

The CAISO recently overhauled its interconnection queue process, significantly increasing interconnection application fees and implementing a cluster approach to interconnection studies. About half of the projects in the queue dropped out when the higher fees were imposed. Under the new cluster approach, transmission system upgrades will be identified for groups of projects located in the same area and estimated costs will be allocated to each project on a *pro rata* basis based on project capacity. The cost estimates provided after the CAISO phase I interconnection study become a cost cap for a project, with any additional costs collected by the transmission owners through rates charged to their transmission customers.

Even with improvements in the process for interconnecting renewable energy projects to the existing transmission system, there are concerns that the current process will become a bottleneck.

What is needed is a transmission superhighway to connect high resource areas to high load areas.

Planning the Transmission Superhighway

The federal Energy Policy Act of 2005 addressed the transmission siting issue by requiring the US Department of Energy to study electric transmission congestion and, if needed, designate "national interest electric transmission corridors." In October

2007, DOE designated two such corridors, one in the mid-Atlantic and the other in the southwest. Applicants for transmission projects within the designated corridors who don't receive approval from state regulators within a year can seek permits from the FERC.

The 2005 law also requires federal agencies to designate energy transport corridors for pipelines, electric transmission and other energy facilities. A "programmatic" federal environmental impact statement for the entire western energy corridor program was completed in November 2007 and, in January 2008, more than 6,000 miles of energy corridors in 11 western states were designated by the US Bureau of Land Management and other federal agencies. Portions of the Sunrise Powerlink southern route are located within one of the designated western energy corridors.

California established a similar corridor designation process in 2006. The authority resides in the California Energy Commission, or CEC. Local agencies are required to take into account any corridor designations when authorizing land use changes to ensure that the designated corridors remain viable. These state corridors will be identified in future "strategic transmission investment plans" developed by the CEC. The 2009 plan adopted in December reviewed the status of transmission corridor planning, including utility indications of potential corridor needs, but did not identify any new corridors for designation. The CEC is working closely with federal agencies to coordinate designation of transmission corridors on federal lands in California.

At the state level, there are multiple entities involved in planning and siting high-voltage transmission lines with somewhat overlapping responsibilities. The CAISO and other transmission operators are responsible for conducting an open and transparent transmission planning process and ensuring non-discriminatory access to the transmission system. The "California transmission planning group" was formed in the past year to coordinate long-term planning among transmission operators. The group brings together not only the CAISO and its participating transmission owners, but also California municipal utilities into a statewide transmission planning effort. The CPUC is responsible for siting investor-owned utility transmission projects in California and is the lead agency for compliance with the state Environmental Quality Act. The CEC is responsible for energy planning and analysis and for designating transmission corridors. There has been discussion of possibly consolidating some of these responsibilities under a single regulatory entity, but there has been little movement.

RETI

To facilitate meeting Gov. Schwarzenegger's aggressive RPS goals and to build on the experience with the Sunrise and Tehachapi transmission projects, the California regulatory agencies, developers, utilities and other stakeholders formed a "renewable energy transmission initiative," or RETI, in 2007. The purpose is to identify renewable energy resource areas that can be developed in the most cost-effective and environmentally benign manner and to scope out the transmission projects needed to develop these renewable resource areas.

RETI is organized and driven by committees.

The coordinating committee includes the CPUC, CEC, CAISO, Southern California Public Power Authority, Northern California Power Agency and the Sacramento Municipal Utility District.

The primary working group is a 29-member stakeholder steering committee, consisting of all of the transmission owners, the CPUC, CEC, CAISO, Bureau of Land Management and US Forest Service, as well as one representative from each of the remaining classes of stakeholders.

A "plenary stakeholder group" represents the interests of all interested parties and reviews the work of the stakeholder steering committee. The plenary stakeholder group meets regularly.

The RETI work plan is organized into three phases. Phase 1, which was completed in January 2009, identified competitive renewable energy zones — called CREZs — that can be developed in the most cost-effective and environmentally benign manner. Phase 2A was completed in September 2009 and refined the analysis of resource potential, costs and environmental constraints for the CREZs identified in phase 1 and developed a conceptual transmission plan to serve the selected CREZs. Phase 2B may further refine the conceptual transmission plan, re-evaluate the contribution of out-of-state resources, and identify short-term measures that would speed inter-connection of some projects before new transmission lines can be built. Phase 3 would turn the conceptual plan into specific proposals for transmission projects that can be pursued for development and siting approval.

Black & Veatch did the phase 1 study. The study focused on California, but also included Oregon, Nevada, Arizona,

Washington, British Columbia and Baja Mexico.

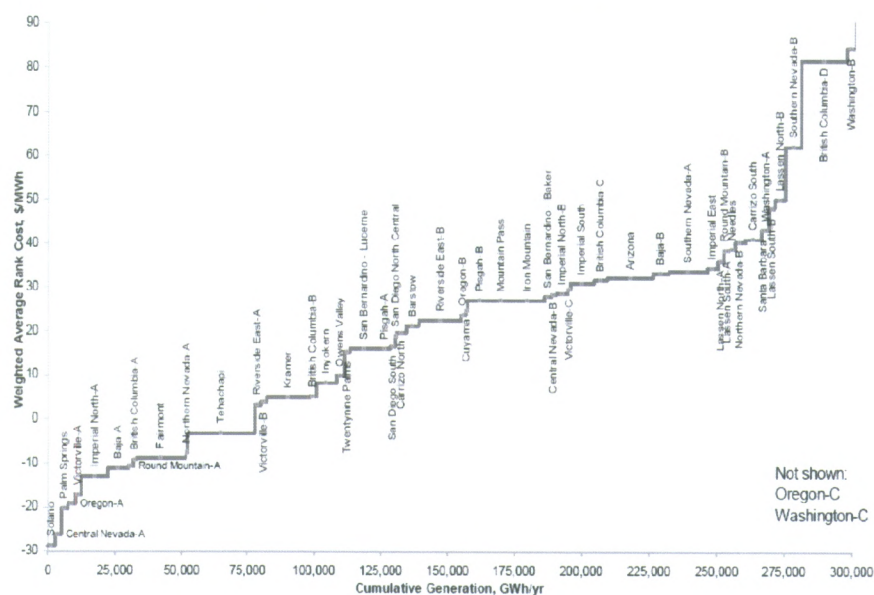
RETI Findings

The study identified 29 potential CREZs in California, with a total resource potential of over 200,000 gigawatt-hours per year (gWh/yr). It also identified 70,000 gWh/yr of smaller non-CREZ projects that do not require large-scale transmission. The remainder of the study area outside of California can provide another 110,000 gWh/yr of renewable resources.

To put these numbers in perspective, the amount of additional renewable generation needed to meet the 33% target in California by 2020 is roughly 69,000 gWh/yr. To account for the fact that not all of the identified resources will be developed, RETI initially set a target of identifying CREZs capable of supplying up to 100,000 gWh/yr.

The CREZs have been ranked in order of economic merit. Each has been assigned a "rank cost" on a \$/mWh basis. The rank cost for each CREZ is based on a generation-weighted average of the resources located within the CREZ. In some cases, CREZs are subdivided for the purpose of ranking to account for areas with both high-cost and low-cost generating projects. As shown in Figure 1, the rank costs and associated generation amounts create a renewable energy supply curve.

Figure 1. CREZ Economic Supply Curve



Source: RETI Phase 2A Final Report, September 2009.

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For any analysis of this type, there is a great deal of uncertainty in input assumptions, especially with respect to future costs and performance. Uncertainty in some assumptions, such as wind turbine costs, will affect all projects and is not likely to affect relative rankings. Other assumptions, such as location or project-specific costs and performance may affect relative rankings and are addressed in the study through the use of uncertainty ranges for capital cost, capacity factor and biomass fuel cost assumptions. These ranges are depicted in Figure 1 as an uncertainty band around the economic scores.

The results using these uncertainty ranges show there is a great deal of overlap among the rankings. In addition to the uncertainty analysis, the RETI study also considered a number of sensitivity scenarios concerning the value of tax credits, energy prices, capacity value, solar PV costs, geothermal potential and the allocation of transmission costs. On the basis of these sensitivity cases, the study identified a list of additional CREZs that could potentially be cost competitive.

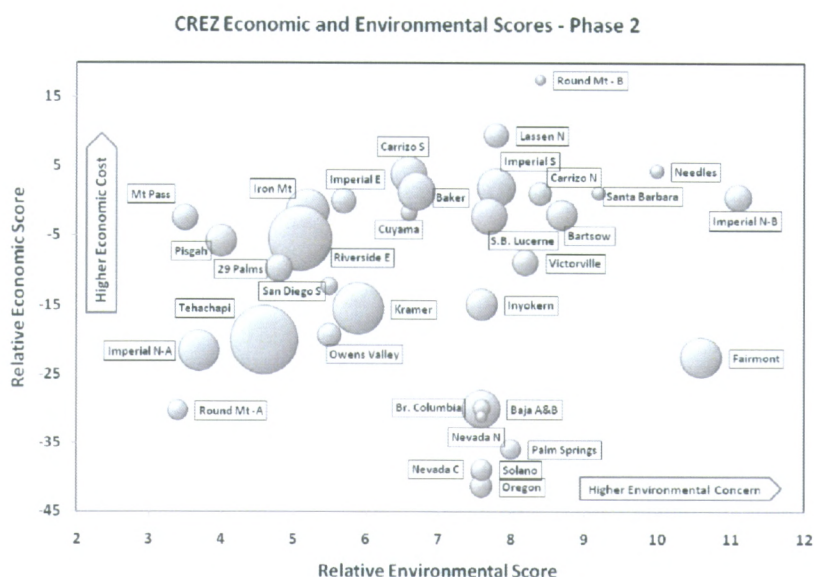
An "environmental working group," chaired by representatives of the Natural Resources Defense Council and the Sierra Club, developed a method for rating the California CREZs on the basis of environmental concerns. The criteria were developed by consensus. For example, during the course of the analysis, the definition of the development footprint for wind areas was modified to include just 3.5% of the total area to reflect the land area actually occupied and disturbed by turbines and roads. This change was made after a great deal of discussion and based on input provided from wind developers.

In each case, a quantitative environmental indicator was selected (for example, acres of land for the energy development footprint), and the value for the CREZ was divided by the total annual energy output for the CREZ. The results were then normalized to a scale from zero to five to develop a ranking score for each criterion and then summed across all criteria to calculate a total ranking score for each CREZ. The resulting environmental supply curve provides a counter-

weight to the economic supply curve described above. The economic and environmental supply curves are combined in Figure 2 to show the relative economic cost and relative environmental concern in an array.

CREZs located in the lower left quadrant have relatively lower economic and environmental costs, while those in the upper right are at the high end of ranking for these factors. Most of the CREZs with the lowest costs and environmental impacts are in southern California.

Figure 2. Economic and Environmental Assessment of California CREZs



Source: RETI Phase 2A Final Report, September 2009.

Based on the results of this CREZ ranking process, which was updated in phase 2A, RETI stakeholders developed a statewide transmission expansion plan showing proposed access to the highest ranked CREZs. The plan is designed to allow enough incremental renewable energy to meet 160% of the estimated statewide renewable net short position in 2020. The plan put a premium on avoiding the need for new rights of way.

The plan devised by the RETI stakeholders consists of three main groups of transmission segments. "Renewable foundation lines" increase the capacity of the California transmission network between Palm Springs and Sacramento. This is the transmission superhighway that allows power to flow north or south as needed.

"Renewable delivery lines" move energy from the renewable

foundation lines to major load centers. These are the off-ramps that ensure deliverability of supply. The on-ramps to the renewable transmission superhighway are “renewable collector lines,” which are grouped geographically to allow access to multiple adjacent CREZs and deliver power from the resource areas to the renewable foundation lines.

The plan identifies segments that are likely to be needed under a range of future scenarios, regardless of whether they are ultimately needed for renewable energy. These are identified as “least-regrets” upgrades and are given the highest priority for further study and development.

With the completion of the phase 2 plan, RETI is at a crossroads.

The next step requires a handoff to the organizations responsible for planning and operating the transmission system. The handoff is expected to the “California transmission planning group” made up of the CAISO and its participating transmission owners as well as municipal utilities. For its part, the CAISO recently issued a draft renewable energy transmission planning process outlining the steps it will take to address renewable energy transmission planning and associated tariff changes. Specifically, the CAISO proposes establishing access to renewable resources as a formal criterion for assessing the need for transmission additions, alongside the existing economic and reliability criteria. One of the challenges facing transmission planners is reconciling the conceptual plans with the existing queue of interconnection requests and contracted resources.

In the meantime, various public agencies can use the RETI conceptual plan to focus environmental studies on the identified areas, address land ownership issues in identified corridors, identify potential routes and alternatives and possibly identify certain line segments for corridor designation.

The California transmission planning group has indicated that it will use the RETI plan as a starting point in its analysis. The group is being encouraged by state regulators to further embrace the transparent, collaborative process developed by RETI. Similarly, the RETI group has been encouraged by Commissioners Jeffrey Byron and Michael Peevey to continue its work and to provide stakeholder input into the detailed planning processes.

Broader Western Effort

While the RETI process is focused on California, a similar effort has been initiated by the Western Governors’ Association to look at potential renewable resource areas and associated transmission corridors in 11 states and parts of Canada and Mexico. Steering committee members include the participating

governors or ministers and their delegates, as well as representatives of state regulatory agencies. The technical committee includes representatives from a broad range of stakeholder interests similar to the RETI groups.

The “western renewable energy zone” or WREZ initiative was launched in May 2008 and has the goal of supporting the development of 30,000 megawatts of new clean energy across the west by 2015.

Depending on the capacity factor of the developed resources, meeting this goal could add roughly 50,000 gWhs to 100,000 gWhs of new generation.

The WREZ group issued a phase 1 report in June 2009 that identified resource hubs throughout the west and provided estimates of renewable resource potential and associated supply curves. As with the RETI process, the WREZ initiative will apply environmental screening criteria when designating renewable energy zones as it completes phase 1. The WREZ initiative is also developing a modeling tool for estimating the economic cost of delivering energy from WREZs to specific load centers. This tool and the environmental screening of identified WREZs will provide the basis for developing a conceptual transmission plan in phase 2. Detailed transmission studies would then be performed by the Western Electric Coordinating Council as part of its transmission planning process. Phase 3 of the WREZ initiative will involve working with state commissions, utilities and generators to coordinate the timing and scope of procurement processes to aggregate renewable energy supply needs and support large-scale development. Finally, phase 4 will involve interstate coordination of transmission siting and permitting and addressing cost allocation issues.

The US Department of Energy awarded \$60 million in December to support these transmission planning efforts. The Western Governors Association received \$12 million. The Western Electric Coordinating Council received \$14.5 million. Similar funding was provided to transmission planning and government agencies in the eastern interconnect and in Texas.

It is clear that these initiatives represent not simply yet another set of studies to sit on the shelf, but will provide the foundation for actual transmission proposals and associated regulatory review. There will be winners and losers in the planning and siting of the transmission superhighway. Projects located near the on-ramps will benefit from the economies of scale and shared costs that these large transmission projects will provide, while projects that are bypassed or located in areas not served by the superhighway will be at a competitive disadvantage. ©

Environmental Update

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disposal prohibitively expensive for owners of some coal-fired power plants and could dramatically affect the market for reuse of coal ash.

Any changes would be in response to a December 2008 spill of approximately 5.4 million cubic yards of wet coal ash from a Tennessee Valley Authority coal impoundment in Tennessee.

EPA currently regulates coal ash as a solid, non-hazardous waste under the Resource Conservation and Recovery Act. It has several options as it considers what to do. It could retain the current regulations. It could regulate coal ash as a hazardous waste. It could regulate only some coal ash as hazardous. It could adopt some sort of hybrid approach.

Some commentators speculate that a hybrid approach might be used to define coal ash as hazardous when discarded, but as non-hazardous waste if recycled for a beneficial use.

If coal ash were defined as hazardous waste, then costs of ash disposal could increase dramatically. According to the Electric Power Research Institute, between 190 and 411 coal-fired units could shut down if ash is regulated as hazardous.

EPA postponed the anticipated release date of proposed coal ash regulations in December, citing the inherent complexity of the analysis.

One concern is that new regulations may dramatically affect the market for using coal ash for beneficial uses. In late December, the American Society for Testing and Materials, an international organization that publishes industry-recognized voluntary standards as guidelines (including specifications for fly ash for use in concrete), sent a letter

to EPA encouraging it not to classify dry ash as hazardous. The group said:

[a] "hazardous waste" designation, even with an exclusion for beneficial use, would cause the ASTM standard for fly ash to be removed from project specifications due to concerns over legal exposure, product liability, and public perception. This will likely result in little to no fly ash being used beneficially in concrete or other applications that support sustainability objectives.

Another consideration that EPA must also take into account is the fact that mercury air emissions limits are becoming increasingly more stringent. As a result, mercury that is not emitted into the atmosphere or discharged in wastewater may be deposited in ash. As the content of mercury in ash increases, the ash may become less suitable for reuse, making it more expensive to dispose of and possibly even voiding existing ash disposal agreements that were premised on the ash being non-hazardous.

— *contributed by Andrew Giaccia and Sue Cowell in Washington*

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Chadbourne & Parke LLP

30 Rockefeller Plaza
New York, NY 10112
+1 (212) 408-5100

1200 New Hampshire Ave., NW
Washington, DC 20036
+1 (202) 974-5600

1100 Louisiana, Suite 3500
Houston, TX 77002
+1 (713) 571-5900

350 South Grand Ave.
32nd Floor
Los Angeles, CA 90071
+1 (213) 892-1000

Chadbourne & Parke SC
Paseo de Tamarindos, No. 400-B Piso 22
Col. Bosques de las Lomas
05120 México, D.F., México
+52 (55) 3000-0600

Beijing Representative Office
Room 902, Tower A, Beijing Fortune Centre
7 Dongsanhuan Zhonglu, Chaoyang District
Beijing 100020, China
+86 (10) 6530-8846

Dostyk Business Center
43 Dostyk Avenue, 4th floor
Almaty 050010, Republic of Kazakhstan
+7 (327) 258-5088

Riverside Towers
52/5 Kosmodamianskaya Nab.
Moscow 115054 Russian Federation
+7 (495) 974-2424
Direct line from outside C.I.S.:
+1 (212) 408-1190

Stroganovskiy Business Centre
19A Nevskiy Prospect
St. Petersburg 191186 Russian Federation
+7 (812) 332-9300

25B Sahaydachnoho Street
Kyiv 04070, Ukraine
+380 (44) 461-75-75

Chadbourne & Parke
Radzikowski, Szubielska and Partners LLP
ul. Emilii Plater 53
00-113 Warsaw, Poland
+48 (22) 520-5000

Chadbourne & Parke LLC
City Tower I, Sheikh Zayed Road
P.O. Box 23927, Dubai, United Arab Emirates
+971 (4) 331-6123

Chadbourne & Parke (London) LLP
an affiliated partnership
Regis House
45 King William Street
London EC4R 9AN, UK
+44 (0)20 7337-8000

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