

Iran's Invisible Opportunity for Energy and Security

Modern energy investments could sideline nuclear ambiguity

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Sufi legend holds (in paraphrase) that the venerable Mullah Nasruddin irked the King once too often with his trenchant wit and was condemned to die. “Sire,” he bargained, “if you spare my life for a year, I will teach your horse to fly.” Incredulous but intrigued, the King agreed. Next day, Nasruddin’s friends remonstrated, “You must be nuts—that old nag will never fly.” The sage replied, “A year is a long time. Many things could change. The King could die. I could escape. I could die. The horse could die. And maybe the damned horse will fly.”

Is the July 2015 nuclear deal between Iran, the United States, and six other powers essential, exciting, promising, dangerous, better than the alternative, or several or all of the above? At its root, Washington’s debate reflects divergent hopes, fears, and visions for what might change in and beyond Iran over the next decade or two. But we needn’t rely on a Pegasus miracle like Iran’s political transformation or a magical calming of the world’s most volatile region. Rather, some pragmatic and principled actions now to use this time well could greatly improve the odds of a good, just, and peaceful outcome.

Today’s cacophony swirls around a peculiar zone of silence—an opportunity almost nobody is discussing. The next 10–15+ years’ severe restrictions on Iran’s nuclear activities offer a unique period in which to advance the security and economic interests of Iran, its neighbors, America and its P5+1 partners, and the world. This opportunity pivots *not on Iran’s military nuclear ambitions but on its civilian energy investments*. Promptly modernizing Iran’s energy strategy offers impressive advantages.

In brief, Iran’s unsuccessful nuclear power program is far costlier and slower than its world-class energy-efficiency and renewable-energy opportunities. Helping Iran shift to those superior alternatives, for reasons its leaders already find compelling, could weaken any domestic energy case for nuclear power and thus help Iran escape the severe consequences of nuclear ambiguity. This would reduce the risk of renewed sanctions, enhance Iran’s prosperity and security, create a new ground for pride, and—since the same logic applies to neighboring countries—help stabilize the region by reversing an incipient nuclear arms race. Aligning domestic energy strategy with economic realities could strengthen Iran’s global integration, political evolution, and international stature without compromising others’ similar goals. Key Iranian officials favor this approach, the technologies are ready and vendors eager, and a similar shift has already proven its value in South America. To explore this thesis, we need to start with a little history.

The origins of Iran’s ambiguous nuclear program

Just four years after the now-acknowledged 1953 Anglo-American coup installed the autocratic Shah on the Peacock Throne, President Eisenhower’s Atoms for Peace program launched U.S.

nuclear aid to Iran. Ironically, one of America's first deliveries was enough weapons-grade uranium (as fuel for a small research reactor) to make one sophisticated bomb. Iran didn't do that, and was among the first signatories of the Non-Proliferation Treaty (NPT) in 1968. But meanwhile, smoldering resentment of the coup and other Western abuses was kindling the 1978–79 Islamic Revolution and subsequent hostilities.

The 1973 oil embargo meanwhile expanded the Shah's nationalist and hegemonic ambitions. Partly to symbolize Iran's renewed prestige and power, he abruptly made a [priority](#) of nuclear energy, then the darling of the wealthiest nations. His nuclear agency's budget became second only to the national oil company's. He wanted 20 reactors, enrichment, and reprocessing—potentially an industrial-strength do-it-yourself nuclear-bomb kit—but Washington got nervous as India tested a bomb in 1974, and the U.S. balked. France and West Germany obliged, and reactor construction at Bushehr began in 1975 without enrichment or reprocessing. Three years later, the U.S. authorized reactor exports, but then the revolution in Tehran froze relations.

Even before the Shah fell, his nuclear-power plans faced growing doubts as a costly Western-inspired extravagance. After the Islamic Revolution, Ayatollah Ruhollah Khomeini declared nuclear weapons “un-Islamic,” stopped the reactor program with one Bushehr unit 85% and the other half complete, and famously said their unfinished concrete silos would be used to store wheat. The German builders abandoned the project. It collapsed into bitter litigation, and a German settlement offer of modern gas-fired plants went nowhere. During the 1980–88 war in which the U.S. favored Iraq over Iran, the Bushehr site suffered billions of dollars' structural damage when Iraq bombed it seven times in retaliation for Iran's failed raid on Iraq's Osirak reactor (just 17 km from Baghdad, yet destroyed by Israel in 1981). But by putting isolated Iran in mortal peril, the war revived Iranian interest in nuclear power (so Russia agreed in 1992 to complete a reactor on the ruins at Bushehr from a mishmash of Russian, German, and Iranian parts)—and also, far from incidentally, in its fuel cycle's options for nuclear weapons.

A.Q. Khan, who stole European enrichment technology for Pakistan's bombs and then opened a supermarket for proliferators, reportedly said, with unknown veracity, that Iran tried to buy three bombs from Pakistan in the 1990s but got only an agreement for parts and plans. Ayatollah Ali Khamenei repeatedly [agreed](#) with his predecessor that bombs are un-Islamic, but some senior clerics and evidently some powerful political leaders disagreed. Iran secretly began acquiring centrifuge technologies in the 1980s, started uranium enrichment in the late 1990s, stopped for a few years under threat of sanctions, and resumed in 2005 despite signing in that year a contract for Russia to supply fresh fuel and take it back after use. (Argentina and China also helped with other aspects of Iran's nuclear revival.) Illicit activities were revealed in 2002, sparking an international crisis. Diplomacy failed. Iran ended up under sanctions that escalated from 2006 and gravely damaged the economy. The new 2015 agreement would lift those sanctions—subject to rapid restoration if a decade or more of unprecedented inspections found cheating, so Iran has strong incentives to carry out its promises.

The logic of nonproliferation

The civilian/military ambiguity inherent in Iran's nuclear power program, though deepened by other seemingly weapons-related activities and missile development, was inherent in the technology. As I noted in [Foreign Affairs](#) in 1980, “*every* form of *every* fissionable material in *every* nuclear fuel cycle can be used to make military bombs, either on its own or in combination with other ingredients made widely available by nuclear power”—all wrapped in innocent-looking civilian disguise, and often heavily subsidized by vendors or their governments. I repeated and [expanded](#) in [Foreign Policy](#) 30 years later (the only change needed was to change “oil” to “coal” throughout) the thesis that safeguards can't fully overcome this inherent ambiguity because “national rivalries, subnational instabilities, and human frailties trump treaties and policing.”

The crux is that “*every* known civilian route to bombs involves *either* nuclear power *or* materials and technologies whose possession, indeed whose existence in commerce, is a direct and essential consequence of nuclear fission power.” Yet conversely, “in a world *without* nuclear power, the ingredients needed to make bombs by any known method would no longer be ordinary items of commerce. They'd become harder to get, more conspicuous to try to get, and politically costlier to be caught trying to get (or supply), because their purpose would be *unambiguously* military. This disambiguation would make proliferation not impossible but far harder—and easier to detect timely, because intelligence resources could focus on needles, not haystacks. Thus phasing out nuclear power is a necessary and nearly sufficient condition for nonproliferation.” Today, as we'll see, this is no longer a fantasy; it's what the global marketplace is [doing](#), whether or not governments understand and like it.

Could Iran, like many industrial countries, step back from nuclear power?

The tense standoff and emerging potential shift in America's vexed relationship with Iran creates a unique, timely, and temporary opportunity to expunge the Iranian nuclear program's ambiguity at its base. Iran's civilian nuclear power program is small, costly, troubled, lacking a business case, and starting to be rapidly displaced by far cheaper, faster, safer, and unambiguously peaceful alternatives. Helping Iranians who seek cost-effective and secure energy solutions to accelerate efficiency and renewables during the decade-plus inspection period could erode any civilian rationale for nuclear power and hence for the uranium enrichment that invited the sanctions. This shift could become a surprisingly powerful impetus for confidence and peace—within Iran, helping to tilt debates, and in its rivalrous region, starting to halt and reverse the incipient nuclear arms race that imperils not just the Persian Gulf but the whole world.

An Iranian efficiency-and-renewables revolution wouldn't be a hard sell to the many Iranians who take economics seriously and want an effective, reliable electricity system. Iran is an energy superpower not just in holding the world's third-biggest and some of the cheapest hydrocarbon reserves, but also in its remarkable potential for efficiency and modern renewables. Efficiency first: huge subsidies, now slated for phaseout, have made Iran one of the world's least efficient energy users, with about three times world-average energy use per dollar of GDP. Yet Iran has nearly 80 million people (half of them under 25), a proud and ancient culture, a strong educational base, strongly entrepreneurial habits, clever technologists, and resourceful industrialists (their improvisational skills honed by sanctions, much as occurred in South Africa).

These plus policy leadership are sufficient to adopt best international efficiency practices—and to harness some of the planet’s best renewable endowments, with which Iran is abundantly blessed.

Iran’s superlative renewable resources

Iran is as sunny as Arizona; enormously more energy falls on its largely empty land than could supply all its energy. Iran’s average windspeeds rival America’s Midwest Windbelt, and its prime sites have world-class wind resources with over 30 GW of economic potential. It enjoys high geothermal potential and good small-hydro and waste-biomass opportunities to complement its existing 10 GW of hydropower. Iran’s current plans to add 5 GW of renewables to its New England-sized 70-GW grid in the next five years—making its windpower market, for example, about as big as that of Britain or France—could quickly get much bigger. How quickly? [Portugal](#), with 22% of Iran’s 2014 GDP, 13% of its people, and 6% of its area, went from 32% renewable power consumption in 2007 (or 15% in the 2005 drought) to 64% in 2014.

Meanwhile, aggressive efficiency gains, spurred by and offsetting higher prices from desubsidization, could slow demand growth from 5 GW a year toward zero (and ultimately perhaps less, just as U.S. electricity demand has been falling since 2007). Giving efficiency at least equal priority with renewables and making them all compete is likely to yield astonishing results. And just fixing the neglected Iranian grid could more than halve its 15% losses, permanently saving the equivalent of a large nuclear power program at a few percent of its cost.

Despite recent years’ bars to most international transactions, Iran has already installed a modest portfolio of windpower (the biggest in the region) and solar power. Anticipating reopened financial conduits and freer trade, Iran is quickly deepening its relationship with European vendors, who unlike Americans have been [allowed](#) to sell renewables to Iran during the sanctions regime. In 2012, President Ahmedinejad earmarked \$620 million for loans to smaller renewable developers. The Energy Ministry includes a supportive renewables agency. Iran has offered generous feed-in tariffs for a decade, just increased them (to 18¢/kWh for wind), offers renewable installation grants, and guarantees to buy all renewable power at world market prices (offering payment indices or oil swaps to reduce exchange-rate risks against the volatile rial). These incentives bespeak a policy eagerness whose logic is obvious.

The government is eager to clean up urban air and to save oil and gas for export. Anything that helps avert sanctions will command wide support. Most modern renewables, unlike conventional power plants, use no water (after 20 unusually hot and dry years in the past 23, ten Iranian provinces are in serious drought). And a stronger civil society, environmental NGOs, and small business are pushing for energy efficiency, renewables, and climate protection. As Iran’s Energy Minister Rostam Qasemi [said](#) in 2012, “Gradual reduction of oil consumption on the one hand and a revolutionary and swift move toward using renewable energies on the other hand are the only appropriate mechanisms which can help the country.” So with the prospect of sanctions’ lifting, vendors are pushing on a wide-open door.

Risks and benefits

Iran's national energy policy has long recognized these potentials and been moving to exploit them to get clean air (its big cities' severe pollution harms public health), increase energy security, balance a budget long strained by huge energy subsidies, boost development in backward rural areas, and save oil and gas for export rather than wasting them at home. These are all good reasons. Other countries recognizing their validity and moving to help Iran capture them will help build mutual trust by showing they welcome Iranian progress. Making modern energy a platform for Iran's renewed engagement with the region and the world might even encourage the emergence of more outward-looking elements and attitudes within Iranian society.

To be sure, Iran has complex internal tensions and challenges. While it is currently more stable than many neighbors—some roiled by its interventions—its political situation remains difficult and fluid. But cautious reform seems sufficiently inevitable that Chancellor Merkel's former Deputy Minister of Defense [says](#) “An Iranian economic miracle, and thus a gradual opening—maybe even a confined secularization—now all seem possible. An Iran that is re-integrated into the international community is a challenge for all countries in the region but, even more, a chance for peace and prosperity.” Clearly the Obama Administration feels that a prosperous rather than impoverished and a reintegrated rather than isolated Iran would be in America's interest too. Many Iranians, exhausted by sanctions, would agree. Time will tell whether this reinforcing of conciliatory and penalizing of aggressive behavior will bear the desired fruit, but the potential gains for all—even ultimately for Iran's Gulf rivals—are impressive. Trying to achieve them looks like a bet with uncertain odds but a big upside and no material downside. It might even give [Russia](#) a mirror for pondering whether its own defiance of sanctions for aggression, “proudly and foolishly marching into the position hastily being vacated by Iran,” is really the wisest course.

There's also an important upside for global climate protection. In 2011, before sanctions severely depressed its economy, Iran was the seventh-biggest national carbon emitter—between Germany and South Korea, and far ahead of Canada, Saudi Arabia, Britain, Brazil, Mexico, South Africa, or Indonesia. By 2013, sanctions had demoted it to #14, but being the ninth most carbon-intensive country even though it uses almost no coal, it's bound to zoom back up the list if lifted sanctions revive its economy. Moreover, Iran has the world's second-largest reserves of the natural gas that makes three-fourths of its electricity, so substituting efficiency and renewables could free up gas to displace the region's fast-growing and more carbon-intensive oil consumption. Refurbishing Iran's decrepit gas infrastructure could also achieve state-of-the-art cuts in climate-endangering methane leaks. With drought stalking her land and “alarming” water conditions in a dozen of her cities including Tehran, Iran's Vice President and top environmental official Masoumeh Ebtekar in 2014 [called](#) climate change “a serious threat to life on earth” with “devastating impacts and consequences.” An oil-rich Gulf nation with a strong stake in stabilizing the climate could be useful.

Iran's failed nuclear power program

In striking contrast, Iran's nuclear power faces severe [headwinds](#). Its tangled [history](#) has so far created one unique, cobbled-together power reactor that started sporadically working in 2011 after a world-record 36 years' construction. Its location where two or perhaps three tectonic

plates meet is lost neither on earthquake-weary Iranians after Fukushima nor on the Arab Gulf states, whose main cities, like the Saudis' oil-rich eastern region, lie downwind. (Not only is the plant at seismic risk, but sabotaging or bombing a large operating reactor could release devastating fallout: Chernobyl emitted about 200 times the radioactivity released by the Hiroshima plus Nagasaki bombs.) Iran has declined to accept liability for nuclear accidents, and is the only nuclear operator outside the IAEA Convention of Nuclear Safety. Its past emergency responses and nuclear safety culture inspire scant confidence abroad. As of 2012, all its reactor operators were reportedly but temporarily Russian.

But the bottom line for Iran's nuclear power program is simpler than safety: supplying just 1.5% of Iran's 2014 electricity, the Bushehr reactor was one of the world's highest-priced, directly costing an estimated \$11 billion (2014 \$). Homebrewed nuclear fuel has even higher costs—perhaps an eighth of a billion dollars per year above market. Iran has claimed that deals like its so-far-fulfilled 2005 Russian nuclear-fuel contract are unreliable because its \$1.2-billion 1974 investment in France's Eurodif enrichment plant (later repaid, though dividends remain blocked by sanctions) never got it enriched uranium—after Iran first reneged, then fell under sanctions. Iran's astronomical price premium for enrichment has naturally reinforced suspicions of motives beyond electricity, especially since a dozen countries (not including the U.S.) offer commercial enrichment services whose market price has halved since 2010. The resulting decade of crippling sanctions raised the Iranian nuclear program's wider [cost](#) in lost foreign investment and oil revenue to well over \$100 billion—perhaps \$500 billion. Although a further four power reactors are proposed to be built by China and perhaps Russia, they'd lack any plausible economic or energy-strategy rationale even if all their enrichment were cheaply done abroad.

Such economic burdens have left the oil and gas industries, the core of Iran's economy, in a shambles. Just their excessive gas flaring could instead generate power equivalent to several large reactors. Iran's uneconomic uranium resources and nuclear-power capacity are all negligible compared with its world-class hydrocarbon endowments, whose modernization was stalled by the capital diverted to nuclear energy, Sanctions' wider economic and social costs were incalculable. In practical effect, Iran's nuclear program hobbled its efforts to make its energy system more diverse, resilient, and independent. Yet Iran could now be encouraged and helped to reverse that regrettable choice, and thereby help demonstrate its expressed peaceful intentions.

Similar regional imperatives

Iran is not the only Middle Eastern nation having second thoughts about nuclear energy while appearing to harbor [ambiguous thoughts](#) about needing military nuclear capabilities. On both sides of the Gulf, forces wanting the option of bombs oppose forces wanting a cost-effective energy strategy. Whatever outside powers do about regional domestic energy choices will strengthen one side of those arguments and weaken the other. Strong Iranian emphasis on peaceful and competitive energy would encourage reciprocity and transparency, and discourage regional suspicion and hedging. Coherent and vigorous efforts to speed such changes could shift the Gulf's emerging nuclear arms race into reverse before it gets durably underway.

Energy economics, not just security, strongly favors this outcome in the Gulf states that did not follow Kuwait, Oman, and Bahrain in dropping their nuclear plans after Fukushima. The United Arab Emirates, unfortunately before seriously assessing modern renewables, hired a Korean consortium in 2012 to build four reactors for \$20 billion, but that's now estimated at \$32–40 billion and may rise further, especially if it's affected by Korea's scandal over fake safety certifications. In contrast, Dubai mandates photovoltaics and last November set a world record for cheap solar power (5.84¢/kWh unsubsidized), attracting swiftly rising interest from other Gulf Arab states. Meanwhile, the Saudis, while signing nuclear cooperation agreements with five countries, [turned out](#) to have no business case for nuclear power, which remains in limbo. Saudi Arabia has successively pushed its nuclear program back, now to 2040, when the Kingdom targets 108 GW of [renewable](#) power (it's now building the world's largest solar desalination plant). Throughout the region, hydrocarbons now used to generate electricity could be most cheaply freed for export—where [feasible](#)—by efficiency and renewables.

Modern renewables now [dominate](#) the world market for new generating capacity. In each of the past four years they added over 80 GW and won over a quarter-trillion dollars' investment—far more than went to nuclear and fossil-fueled generators combined. In 2014 alone, the world added over 20 times as much wind and solar capacity as net nuclear additions. Nuclear power continues its slow-motion economic and logistical [collapse](#) despite its generally larger and longer subsidies. This century has seen global nuclear power capacity grow only 4% as much as modern renewable capacity, whose average kilowatt produces 62% as much annual electricity. From 1997 (the year of the Kyōto Protocol) through 2014, for every unit of electricity added by the growth of nuclear power worldwide, photovoltaics added 1.3, windpower 4.7, and other modern renewables (excluding big hydro dams) more than 3.0. Ninefold ahead in output growth, these modern renewables should together surpass total nuclear output next year. This rout is driven by basic economics. Both Arabs and Persians like to ride a winning horse.

The Sunni Arab states' regional rival Iran could better demonstrate its scientific prowess and feel pride in its undoubted technical capabilities by pursuing the successful technologies of tomorrow than the fading technologies of yesteryear. And if foreign suppliers and partners reciprocated growing Iranian transparency with access to the latest inherently peaceful energy technologies—those best able to deliver clean and affordable energy—they could disprove the fiction that foreign imperialists are trying to keep Iran down by denying it access to advanced technologies.

What about the Non-Proliferation Treaty (NPT)?

A central argument of Iranian negotiators has long been their “inalienable right,” under [NPT](#) Article IV, to nuclear energy for peaceful purposes—though the Treaty's requirement of conformity with Articles I and II actually requires those purposes to be *exclusively* peaceful, contrary to some of Iran's past illicit activities in violation of its NPT obligations, as well as some it wishes to continue. The recent negotiations reinforced Iran's permissive interpretation including the inherently ambiguous activities of enrichment and reprocessing (making it harder for Gulf Arab states to accept restrictions on doing the same, and hence over time reducing Iran's security). Yet a modern Iranian energy policy could support a very different approach to reconciling Article IV with global security imperatives and resolving the seeming contradiction

at the heart of the NPT—while also, as a free byproduct, speeding climate protection and the accelerating global journey beyond oil. This approach is rarely discussed but refreshingly simple.

As I wrote in *Foreign Policy* in 2010, “When the NPT was drafted in 1958–68, nuclear power was widely expected to be cheap, easy, abundant, and indispensable. Non-weapons states’ reward for forgoing nuclear weapons was therefore framed as access to nuclear power—but only, as I’d explained in 1980, ‘...because of the nuclear context and background of the negotiators, not as an expression of the essential purpose of Article IV....The time is therefore ripe to reformulate the bargain in the light of new knowledge. Instead of denying or hedging their obligations, the exporting nations should fulfill it—in a wider sense based on a pragmatic reassessment of what recipients say their real interests are.’ Having [forsworn] bombs, recipients want reliable and affordable energy [services] for development. The past half century has revealed manifestly cheaper, faster, surer, more flexible methods than nuclear power, so now, just as I put it in 1980, ‘recipients should insist on aid in meeting their declared central need: not nuclear power per se but rather oil [and now coal] displacement and energy security.’ Reinterpreting Article IV in light of a half century of energy experience can isolate legitimate from illegitimate motives and help smoke out proliferators, advancing the treaty’s central goal. Let countries that still want specifically nuclear energy, rather than cheaper and more suitable options, explain why.”

This logic would become even crisper if countries like the U.S. and U.K. abandoned their own longstanding attachment to uncompetitive nuclear power projects supported by subsidies rivaling their cost. As former U.S. Nuclear Regulatory Commissioner Peter Bradford notes, “Many countries have pursued nuclear power programs that make little economic sense, often as a result of bureaucratic or political imperatives or odd notions of what constitutes national prestige.” (Sounds rather like Iran, doesn’t it?) But they could more convincingly question the economics of nuclear power in potential breakout states like Iran if their own energy strategies and investments took economics seriously.

Has this worked anywhere else?

Some may think that governmental or private-sector efforts to help shift Iranian energy policy toward efficiency and renewables are just a quixotic gesture unlikely to weaken the nuclear ambitions of Iranian militarists. They might prove right in the end. But two examples suggest otherwise: Argentina and Brazil. Though neither is a fundamentalist theocracy, their example is instructive. Both countries have transcended strong military nuclear ambitions, their resulting ambiguous nuclear power programs, and military dictatorships. Argentina had even gone so far as to build unsafeguarded enrichment and reprocessing facilities, and its militarists’ strength was amply demonstrated by the brief but disastrous war with Britain over the Falkland Islands. Yet Argentina didn’t build a bomb, and after three decades of ambiguity, its proliferation threat today seems remote as its neighborhood lurches toward normality. Confidence-building efforts begun in 1983 under regained democratic rule, plus mutual inspections set up in the early 1990s, halted and [reversed](#) the Argentina-Brazil nuclear-arms and ballistic-missile races. Both countries still have nuclear power programs (and Brazil is building a nuclear submarine), but neither has had a happy nuclear experience. Both are now becoming leaders in renewable energy, where their growing success will help their early nuclear emphasis continue to dwindle.

Argentina, the first user of nuclear power in Latin America (launched in 1950), got 4% of its 2014 electricity from three power reactors, the second of which, after 28 years, now needs very costly refurbishment. Last year, a third unit started up after 33 years' construction, and construction began, 13 years late, on a domestically designed and as yet unlicensed mini-reactor (2% of normal size) expected to cost a world-record \$17,000/kW. China has agreed to build a \$6-billion heavy-water reactor for 2022 and a copy of the untested Hualong One light-water reactor if Chinese firms have complete priority, yet financial and logistical challenges are great. Meanwhile, though, Argentina is also shifting toward renewables. It provides feed-in tariffs and net metering, is the world's #5 biodiesel producer, ran a 2015 geothermal auction, and along with Brazil, Chile, and Perú, has awarded over 13 GW of renewable capacity through competitive tenders since 2007. Argentina expects to produce 8% of its electricity renewably by next year, and its renewable-energy experience stands in striking contrast to its consistent nuclear disappointments.

Analogously, Brazil gets 3% of its 2014 electricity from two reactors started in 1981 and 2000, the latter taking 24 years to build. At the third unit, now under construction, alleged bribery just led to the arrest of the national utility's nuclear boss, while the main supplier, France's AREVA, is broke and needs an \$8-billion state bailout, so big constructors have stopped work for nonpayment. The rest of what was in 1975 the world's largest-ever reactor deal (Germany agreed to provide eight units) got cancelled for lack of money and suspicion about military motives. Brazil, besides being the world's #2 in hydropower, generated more 2014 electricity from nonhydro renewables than from nuclear power. So did China, Germany, India, Japan, Mexico, the Netherlands, and Spain—a list including 45% of the world's population and three of the largest four economies. Brazil's energy plan through 2022 includes no more nuclear projects because hydro and other renewables will meet all needs, even before efficiency gains serious priority. Brazilian markets have yielded such inexpensive renewables that 890 MW of photovoltaic contracts were awarded at an average bid price of 8.7¢/kWh, while a recent auction had to exclude windpower in order to motivate other technologies' providers to bid.

Renewable deployment is maturing and proving highly reliable. In 2014, four European countries not especially rich in hydropower got about half their electricity consumption from renewables (Spain 46%, Scotland 50%, Denmark >50%, Portugal 64%)—not to mention Italy (38%) and Germany (27%). Several of these countries are already strong commercial partners in Iran's renewable energy growth. They could help Iran build an indigenous industry to benefit underemployed and disaffected youth and harness local technical ingenuity and commercial talent, strengthening the base for a prosperous society and thriving industry. Moreover, an Iran that could say it has demonstrated the sophistication to build a nuclear program, has established the right to do so, yet is choosing to turn from outmoded to cutting-edge energy choices, would not only outpace its regional rivals and perhaps even the United States in the clarity and modernity of its energy policy; it could also gain honor and moral authority in the region and the world.

What should leaders do?

Helping other nations with efficiency and renewables as alternatives to nuclear power is not just a nice idea; it is required by U.S. law. Title V of the [Nuclear Non-Proliferation Act](#) of 1978 requires the U.S. to help other nations develop non-nuclear energy resources, help developing countries apply them (consistent with their resources, economics, and environment), encourage other industrialized countries to commit to such cooperation and aid, emphasize solar and other renewables, and conduct expert exchanges, analyses, and coordination with foreign aid. A “scientific peace corps designed to encourage large numbers of technically trained volunteers to live and work in developing countries...[to engage] in projects to aid in meeting [their]...energy needs through...widespread utilization of renewable...energy technologies” must be considered, along with “other mechanisms” for a “coordinated international effort” to these ends. In 1979, the International Development Cooperation Act further [required](#) assistance with efficiency and decentralized renewables to relieve poverty.

The U.S. government has immense resources—complemented by state, local, and nongovernmental allies—that could support such efforts in Iran. High-level relationships built in their recent negotiations could kickstart collaboration. (Ultimately the Pentagon’s exemplary leadership in efficiency and renewables for its own operational reasons might even get the Republican Guard’s attention.) In a world of dwindling nuclear prospects but burgeoning efficiency and renewables, cooperating to speed a modern Iranian energy strategy may work even better with partners like Chancellor Merkel and President Hollande who have already broadened their energy priorities and whose industries have long experience in Iran.

Governments should steer, not row, and many countries’ capable private firms are eager to get their oars in the water. Competition will be broad and brisk. Consider China, the world leader in making or installing seven kinds of renewable energy technologies and in total annual renewable and efficiency investment. While China’s nuclear-power schedules slip, its renewable targets keep being surpassed, largely by vibrant private enterprise with nine times China’s annual nuclear investments. China is set to exceed its 2020 targets of 100 GW of solar and 200 GW of windpower. In each of the past three years, China’s windpower has outproduced its nuclear power (as also in India for the past two years). In 2013 alone, China added more photovoltaic power capacity than the U.S. had added since inventing modern PVs in 1954. And India’s recently quadrupled renewables target would add 175 GW just during 2015–22—about 2.5 times Iran’s total generating capacity today.

Iran’s new energy partners will need to see its energy economics and energy security needs through a wide-angle lens, not just the narrow slit of nonproliferation. Yet from that multidimensional perspective, mutual respect and sincere collaboration could grow. This should be low-risk and high-payoff for both sides. It is time for public- and private-sector leaders to help make it so.

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