

Iran and the P5+1: Solving the Nuclear Rubik's Cube

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Executive Summary

In a region of troubles, the negotiations over Iran's nuclear program stand out. The first-step agreement, signed in November 2013, broke a decade of futile diplomatic forays punctuated by mutual escalation. The product of a rare confluence of political calendars and actors, it set a framework for a balanced arms-control agreement that could form the basis of a comprehensive nuclear accord. But reasons for caution abound. It is easier to pause than to reverse the escalation pitting centrifuges against sanctions. Mistrust remains deep, time is short, and the process remains vulnerable to pressure from domestic and regional detractors. In bringing the sides together, the accord revealed the chasm that separates them. Success is possible only with political will to isolate the deal – at least for now – from its complex regional context. It will ultimately be sustainable only if the parties, building on its momentum, recognise that their rival's legitimate interests need to be respected. But a far-reaching resolution of differences will be possible only after a relatively narrow, technical nuclear agreement.

The main objective of the P5+1 (the five permanent UN Security Council members plus Germany) is to constrain Iran's nuclear program. In Geneva, where the agreement – officially known as the Joint Plan of Action – was signed, the group for the first time agreed to Iran maintaining some enrichment capacity. But it has demanded that Tehran significantly roll back its enrichment capabilities, close the bunkered enrichment facility in Fordow and heavy-water plant in Arak; and demonstrate the peaceful nature of its nuclear program by detailing past activities and allowing, for an extended period, intrusive monitoring. Fearing that it would be easier for Iran to reverse its nuclear concessions than for the West to renew its isolation, the group insists on retaining sanctions leverage, even through implementation of the final step of a comprehensive agreement.

Iran believes that the P5+1's objective is to contain not simply its nuclear program, but also the Islamic Republic itself. It contends that it has been singled out, uniquely among signatories of the 1968 Treaty on the Non-Proliferation of Nuclear Weapons (NPT), to prove a negative, that its nuclear program does not aim at weaponisation. Tehran insists on preserving a substantial part of its nuclear infrastructure, in view of the enormous cost it has paid for it. While willing to accept heightened verification measures in order to enable the International Atomic Energy Agency (IAEA) to establish the peaceful nature of its program, it insists that they be temporary and respectful of its national security requirements. It also demands significant and immediate Western reciprocation of any nuclear concession.

From these starting points, it would appear that the P5+1's maximum – in terms of both what it considers a tolerable residual Iranian nuclear capability and the sanctions relief it is willing to provide – falls short of Iran's minimum. Nevertheless, it is still possible to reach a comprehensive agreement on a limited nuclear program – though an uncomfortable one for sceptics like Saudi Arabia and Israel that object on principle to Iran retaining any enrichment capacity. Negotiators will not get far, however, by trying to define Iran's "practical needs" for enriched uranium (an approach endorsed in Geneva), since needs are a matter of interpretation about which Iran and the P5+1 differ. Focusing on "breakout time" – the time required to enrich

enough uranium for one weapon – will not stand them in better stead, as it is based on theoretical, unpredictable and plastic calculations.

What is needed, rather, is a compromise that satisfies both sides' irreducible, bottom-line requirements: for Iran a meaningful enrichment program, continued scientific advancement and tangible sanctions relief; and for the P5+1, a firewall between Iran's civilian and potential military nuclear capabilities, airtight monitoring mechanisms and sufficient time and Iranian cooperation to establish trust in the exclusively peaceful nature of the country's nuclear program. Such a solution would enable them to sell the deal at home and serve as a springboard for developing a different kind of relationship.

This report presents a blueprint for achieving that agreement. It is guided by four objectives: building a firewall between Iran's civilian and potential military nuclear capabilities by constraining the most proliferation-prone aspects of its nuclear program; enhancing transparency by establishing rigorous monitoring and verification mechanisms; ensuring implementation and deterring non-compliance by establishing objective and compulsory monitoring and arbitration mechanisms, as well as by devising, in advance, potential responses to breaches by either party; and bolstering the parties' incentives to remain faithful to the agreement by introducing positive inducements rather than purely negative ones.

A comprehensive agreement based on these principles should be implemented in three phases, the first of which would start with steps that clearly demonstrate the parties' commitment to the process and provide them with immediate tangible benefits, while delaying the heavy lifting until their investment in the process is greater, the costs for withdrawing higher and at least some sceptics have bought into the process.

The basic elements of the approach include:

- ❑ permitting Iran a contingency enrichment program that could be dialled up in the event of nuclear fuel denial, though constrained enough that any breakout could be promptly detected and, through a defined response, thwarted;
- ❑ converting the heavy-water research reactor in Arak to diminish the amount of plutonium it produces;
- ❑ transforming the bunkered facility in Fordow into a proliferation-resistant research and development centre;
- ❑ introducing transparency measures that exceed Iran's existing obligations but conform with its legitimate security and dignity concerns and that the P5+1 should acknowledge will be temporary;
- ❑ providing Iran significant but reversible sanctions relief in the early stages of the comprehensive agreement, followed by escalating further relaxation, including open-ended suspension or termination of restrictions in accordance with progress on the nuclear front;
- ❑ establishing positive incentives by strengthening trade ties, and increasing civilian nuclear and renewable energy cooperation between the parties; and
- ❑ coordinating messages to reassure both sides' regional allies and rivals, and to avoid inciting hardliners as leaders sell the agreement at home.

The detailed recommendations that follow lay out this path in 40 actions. It is a path that carries risks for both sides. There is no guarantee that Iran will remain faithful to its commitments after international attention shifts. Nor is there certainty that the U.S. Congress will accept the deal and provide the president with the necessary authority on sanctions.

These risks notwithstanding, the alternatives are less attractive. A series of partial, interim deals would lessen the chances of reaching a final agreement, fall short of satisfying either party and strengthen hardline critics. A return to the status quo ante, with each side ratcheting up its leverage in the hope of forcing the other to capitulate, would very possibly lay the tracks for a scenario in which Iran attains a nuclear bomb while sanctions cause it grave harm. Most dangerous would be a military strike, which could set back Iran's nuclear march temporarily, but at the cost of spurring it to rush toward the ultimate deterrent, while retaliating in a variety of asymmetric or non-conventional ways, with unpredictable but certainly tragic regional ramifications.

If odds of the talks collapsing are high, the stakes of failure are higher. At the very least, a breakdown would reduce the possibility of success later, as it would erode trust and stiffen positions. The region and the world will be a safer place for a compromise that protects everyone's core interests, contains Iran's nuclear program and rehabilitates the country's economy and international standing.

Recommendations

Upon signing the comprehensive agreement

To the government of Iran:

1. Reaffirm that in accordance with the Supreme Leader's *fatwa*, it will never seek or develop nuclear weapons and will apply facility-specific safeguards, based on Information Circular 66 of the International Atomic Energy Agency (IAEA), to all its current and future enrichment and nuclear fuel fabrication facilities.
2. Declare a policy of maintaining an Open Fuel Cycle; ie, refrain from reprocessing spent fuel.
3. Accept to maintain a "zero-stockpile" of enriched uranium, by converting any stockpile of fissile material in the form of uranium hexafluoride or uranium oxide powder to nuclear fuel rods in a short period of time; and pledge not to build any reconversion lines.

To the P5+1 (China, France, Russia, the UK, U.S. plus Germany):

4. Endorse the comprehensive agreement via a new UN Security Council resolution.
5. Provide legally-binding guarantees to supply fuel for Iran's nuclear power and research reactors.
6. Refrain from imposing any additional nuclear-related sanctions.

Phase I: For a period of one to two years following the signing of a comprehensive agreement

To the government of Iran:

7. Limit its uranium enrichment capacity to a contingency program capped at 6,400 SWU in one facility (Natanz). Relocate any excess centrifuges from Fordow and Natanz's Hall A to Natanz's Hall B for storage under the IAEA's seal and video surveillance.
8. Cooperate with the P5+1 on fuel manufacturing in Isfahan in order to convert Iran's entire stockpile of 5 and 20 per cent low-enriched uranium into fuel rods by the end of this period.
9. Convert Fordow into a research and development facility at which only individual machines could be tested. The net enrichment output should be zero, as products and tails are recombined at the end of the process. Other non-enrichment related nuclear research also could take place at the facility. More advanced machines could be tested in a maximum of two interconnected cascades in Natanz, with the IAEA allowed to evaluate their enrichment capacity. Also, limit enrichment capacity per centrifuge in the R&D sector at all facilities to 5 SWU/year.
10. Modify the Arak heavy-water reactor, in cooperation with the P5+1, so that it operates, at a lower power level, on 5 per cent enriched uranium; allow either in-house inspectors or remote surveillance to monitor the facility upon introduction of nuclear material; agree to ship out its spent fuel as soon as it can be transported safely; and halt the production of natural uranium oxide fuel.

11. Implement all elements of the Additional Protocol of the IAEA, modified Subsidiary Arrangement Code 3.1 and all the additional enhanced safeguards and transparency measures outlined in the 24 November 2013 Joint Plan of Action signed with the P5+1.
12. Manufacture, assemble and test centrifuges and their parts only in locations open to IAEA inspections; allow the agency to tag the produced centrifuges for accountability purposes; and declare the stocks of raw material to the IAEA.
13. Limit mining, milling and conversion of uranium to levels commensurate with enrichment activities, and allow the IAEA to conduct regular material accountancy measurements at the uranium conversion plant in Isfahan.
14. Resolve satisfactorily with the IAEA all past and present issues related to the "possible military dimensions" of the nuclear program and take all necessary corrective measures.
15. Ratify the 1994 IAEA Convention on Nuclear Safety, consistent with the respective prerogatives of the executive and legislative branches of the Iranian government.

To the P5+1:

16. State that they reject categorically any armed attack or threat against nuclear facilities devoted exclusively to peaceful purposes and deem any such coercive action a violation of the principles of international law and specifically of the UN Charter and IAEA Statute.
17. Extend and expand the suspension of all sanctions outlined in the Joint Plan of Action; and delist Iranian banks and nuclear organisations blacklisted by the UN Security Council resolutions.
18. Release half of Iran's frozen oil proceeds in monthly instalments, allow repatriation of future oil revenue and release Iran's impounded assets under U.S. Executive Order 13599.
19. Resume gradually European imports of Iranian petroleum and lift the EU transaction threshold on permissible trade with Iran.
20. Lift the ban on providing financial messaging services to Iranian banks and permit trading in Iranian currency (the Rial); rescind designation of Iran as a jurisdiction of primary money laundering concern; and permit U-turn transactions in U.S. dollars.
21. Facilitate further humanitarian trade with Iran.
22. Cooperate with Iran to modify the Arak reactor, provide its fuel manufacturing technology or fuel upon completion and sell Iran medical isotopes at market prices.
23. Confirm that any report by the IAEA regarding Iran's past nuclear activities will be reported to the agency's Board of Governors and the Security Council for information purposes only.
24. Collaborate with Iran on issues of safety for nuclear power plants and research reactors, including assessment of risks, promotion of safety-oriented solutions and research on nuclear applications in medicine and agriculture.

Phase II: *For a period of five to seven years after successful completion of Phase I*

To the government of Iran:

25. Ratify the 1996 Comprehensive Nuclear Test-Ban Treaty in accordance with the Supreme Leader's *fatwa* against nuclear weapons.
26. Increase its uranium enrichment capacity to a contingency program capped at 9,600 SWU; maintain the limit on enrichment capacity per centrifuge in the R&D sector at all facilities at 5 SWU/year
27. Limit mining, milling, and conversion of uranium to enrichment needs.
28. Sign the 2002 Hague Code of Conduct against Ballistic Missile Proliferation.
29. Adhere to the Nuclear Suppliers Group guidelines, and collaborate with the P5+1 to establish export control programs.

To the P5+1:

30. Obtain the authority for lifting, suspending with open-ended waivers or otherwise relaxing the sanctions outlined in Appendix B of this report based on an agreed schedule, contingent in all cases on Iran's compliance with its commitments.
31. Release incrementally the second half of Iran's frozen oil proceeds and relax sanctions on investment and provision of goods and services to Iran's petro-chemical sector.
32. Provide firm guarantees for Iran's access to advanced civilian nuclear research and power reactor technology in conformity with Articles I, II and IV of the NPT.
33. Negotiate and conclude contracts for two additional light-water research reactors and two nuclear power plants; and pledge to provide the fuel for these reactors and to repatriate their spent fuel during their entire lifespans.
34. Transfer cutting-edge technologies related to renewable energies to Iran.

Phase III: *For a period of eight to ten years after successful completion of Phase II*

To the government of Iran:

35. Ratify the Additional Protocol of the NPT.
36. Stop implementing transparency measures beyond its Comprehensive Safeguards Agreement, the Additional Protocol and modified Subsidiary Arrangement Code 3.1 gradually, upon the IAEA's drawing "broader conclusions" that there are no undeclared nuclear activities and materials in Iran.
37. Limit its uranium enrichment capacity voluntarily to a contingency program capped at 19,200 SWU and limit per centrifuge enrichment capacity in the R&D sector to 10 SWU/year.

To the P5+1:

38. Upon the IAEA drawing its “broader conclusions”, lift the remaining UN Security Council sanctions, with the exception of restrictions on procurement and export of dual-use material and technologies that will be lifted at the end of this phase.
39. Lift sanctions incrementally on investment in and provision of goods/services to Iran’s natural gas sector, followed by similar measures related to Iran’s oil sector.
40. The EU and other willing partners will develop a strategic energy partnership through a Trade and Cooperation Agreement and declare Iran a long-term supplier of fossil energy.

Istanbul/Tehran/Geneva/Vienna/Brussels, 9 May 2014

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I. Introduction

The agreement reached in Geneva between Iran and the P5+1 (the five permanent UN Security Council members and Germany) on 24 November 2013 was a significant step toward resolving the protracted standoff over Iran's nuclear program.¹ The challenge now is to use the breathing space to tackle the longer-term concerns deferred in Geneva, including Iran's future uranium enrichment capacity, enhanced transparency measures and sanctions relief. Ultimately, the supreme importance of resolving these technical issues notwithstanding, any agreement on the nuclear file will not be sustainable without addressing the broader and still more complex matter of Iran's regional role.

According to the Joint Plan of Action (JPOA), Iran agreed to undertake the following measures for a period of six months, subject to renewal:²

- ❑ neutralise its stockpile of 20 per cent uranium by converting it to a less proliferation-prone oxidised form or down-blending it to 3.5 per cent;
- ❑ cap its uranium enrichment at 5 per cent and maintain the size of its 5 per cent stockpile by oxidising any additional production;
- ❑ refrain from installing new centrifuges, operating those idle prior to the agreement and building new enrichment facilities;
- ❑ abstain from commissioning the heavywater reactor in Arak; transferring fuel, new components, or heavy-water to it; and testing and producing fuel for it;
- ❑ desist from reprocessing spent fuel to extract plutonium and build facilities for that purpose;
- ❑ provide the International Atomic Energy Agency (IAEA) with more information about its current and future facilities; and
- ❑ permit daily access to surveillance records at the Fordow and Natanz facilities, and managed access to centrifuge assembly facilities, rotor production workshops and uranium mines and mills.

¹ The principal thrust of the accord was in line with Crisis Group's past recommendations. See Middle East Report N°51, *Iran: Is There a Way Out of the Nuclear Impasse?*, 23 February 2006; Middle East Briefing N°34, *The P5+1, Iran and the Perils of Nuclear Brinkmanship*, 15 June 2012; Middle East Report N°138, *Spider Web: The Making and Unmaking of Iran Sanctions*, 25 February 2013; and Middle East Briefing N°36, *Great Expectations: Iran's New President and the Nuclear Talks*, 13 August 2013.

² "Joint Plan of Action" (JPOA), IAEA, 24 November 2013. The full text of the agreement is available at www.iaea.org/Publications/Documents/Infcircs/2013/infcire856.pdf.

In return, the P5+1 pledged to halt efforts to further reduce Iran's petroleum exports; permit partial repatriation of its oil revenue;³ suspend U.S. and European Union (EU) sanctions on petrochemical exports, trade in precious metals, and spare parts and services related to Iran's civil aviation safety;⁴ pause U.S. sanctions on Iran's auto industry; refrain from imposing new nuclear-related sanctions;⁵ and facilitate humanitarian and other permissible transactions by establishing specific financial channels.⁶

The JPOA also defined the main elements of a future comprehensive accord (also known as the "final step") that the two sides would "conclude negotiating and commence implementing no more than one year" after implementing the Geneva agreement.⁷ These include lifting all nuclear-related sanctions, permitting Iran to retain a limited and intrusively-monitored uranium enrichment program and the possibility of civil nuclear cooperation between the parties to the agreement. Following successful implementation of this final step, Iran's nuclear dossier is to be "treated in the same manner as that of any non-nuclear weapon state party to the NPT".⁸

While only a first step, the agreement was an important breakthrough after a decade of futile diplomatic forays. If successfully implemented – and the process is now well under way – it would virtually eliminate the possibility of an undetected dash toward nuclear militarisation by suspending and, in some cases, rolling back Iran's most proliferation-prone nuclear activities. Concurrently, it would blunt the proposition that sanctions themselves could not be rolled back, by providing Iran with tangible economic and humanitarian relief for the first time since the 1979 revolution. That said, the reversible nature of the concessions allowed each party to retain sufficient leverage to guard against the other's potential renegeing.

At first glance, the prospects for a comprehensive agreement seem inauspicious. A history of mutual suspicion hangs over the negotiations that commenced in Vienna in February 2014. The West, in light of Iran's record of concealing its nuclear activities prior to 2003 and obfuscation of IAEA investigations, deems Tehran's intentions suspect; since its nuclear know-how cannot be erased, its capabilities must be constrained.⁹ It is through this prism that the P5+1 justifies treating Iran differently than other NPT member states, placing the onus on it to prove the peaceful nature of its nuclear program and insisting on retaining sanctions leverage.¹⁰

³ The sum to be transferred to Iran reportedly amounted to \$4.2 billion. "Fact Sheet: First Step Understandings Regarding the Islamic Republic of Iran's Nuclear Program", The White House, 23 November 2013.

⁴ This includes sanctions on associated services, eg, insurance, transportation and financial services, to non-designated Iranian entities. The White House estimated that these measures could provide Iran with approximately \$1.5 billion in revenue. JPOA and "Fact Sheet", both *op. cit.*

⁵ The language left room for U.S. Congressional sanctions by stating "The U.S. Administration, acting consistent with the respective roles of the President and the Congress, will refrain from imposing new nuclear-related sanctions". JPOA, *op. cit.*

⁶ This includes \$400 million to defray the tuition costs of Iranian students, as well as transactions required to pay Iran's UN obligations. "Fact Sheet", *op. cit.*

⁷ The JPOA entered into force on 20 January 2014. The first six-month period ends on 20 July 2014; the final deadline – in case of a rollover – would be 20 January 2015.

⁸ JPOA, *op. cit.*

⁹ Since 2007, the U.S. intelligence community has concluded: "Iran has the scientific, technical, and industrial capacity to eventually produce nuclear weapons. This makes the central issue its political will to do so". For the most recent iteration of this conclusion, see "Worldwide threat assessment of the U.S. intelligence community", James Clapper, Senate Select Committee on Intelligence, 12 March 2014.

¹⁰ Crisis Group interviews, U.S. and EU officials, Vienna, February-April 2014.

Iran in turn feels that the West discriminates by demanding that it – uniquely among NPT parties – prove a negative: that it has no intention to acquire nuclear weapons. It also suspects the West of seeking to diminish its nuclear program as part of a larger design to subvert its regime. Given the enormous cost it has paid for its nuclear program, Tehran demands significant Western reciprocation for any concession on its nuclear achievements.¹¹

Aware of the wide gulf between their objectives and approaches and the difficulty of matching the P5+1's maximum – in terms of both what Iranian nuclear capability it is willing to tolerate and the sanctions relief it is willing to provide – with Iran's minimum of what it believes it must retain and obtain, the parties deferred the heavy lifting to the end. Unlike the first-step agreement in Geneva – that had a narrow focus on familiar issues already debated for two years and was fast-tracked with confidential bilateral U.S.-Iranian talks – this round aims to comprehensively address all aspects of the nuclear dispute. It is not apparently supplemented by a parallel, behind-the-scenes track, as helped in negotiating the first agreement.¹² Nor is there a track for regional issues; attempting to isolate the nuclear issue from the multiple and overlapping crises that contribute to its gravity and intricacy will leave the talks, and the implementation of any agreement arising from them, vulnerable to manipulation by players with interests but without a seat at the table.

No less challenging is the window of time the negotiators have set for themselves: U.S. President Barack Obama's administration is near its final quarter, and its potential achievements could be reversed by its successor unless they garner enough support to convince critics that their undoing would prove more costly than their endorsement; too, calculations in Iran may soon shift, if negotiations do not produce tangible dividends sufficient to assure a sceptical polity of their value.

Despite these flaws and risks, however, alternatives to the process are less attractive. A series of partial, interim deals addressing only certain concerns likely would drag it out and strengthen hardline critics on both sides working to derail it.¹³ Likewise, an approach that seeks simultaneously or in parallel to address Iran's role in the region, its human rights record and what it perceives as the West's atavistically hostile posture could complicate much further an already complex endeavour, raise the stakes and render it more vulnerable to breakdown.¹⁴ Time, both sides agree, is

¹¹ Crisis Group interviews, Iranian officials, Geneva, Tehran, Vienna, November 2013-April 2014.

¹² Crisis Group interviews, U.S. and Iranian officials, Vienna, February-April 2014.

¹³ A senior U.S. official said, "the Joint Plan of Action says nothing is agreed until everything is agreed, and I would add to that nothing is agreed till everyone agrees to it". "Background Briefing on the Upcoming P5+1 Talks on Iran's Nuclear Program", U.S. Department of State, 4 April 2014.

¹⁴ A U.S. official said, "when in 2012, Iran wanted to address regional issues in the talks, our regional allies warned against negotiating with the Iranians behind their back. Now, they criticise us for tackling the nuclear issue in isolation". Crisis Group telephone interview, November 2013. For Iran, mistrust is the main impetus for narrowing the scope of negotiations. A senior Iranian official said, "there is a legacy of distrust that derives from our past experiences. In the 1980s we helped release American hostages in Lebanon, but the U.S. never reciprocated our help. Again in 2001, Iran aided the U.S. in stabilising Afghanistan, for which we were rewarded by inclusion in the 'axis of evil'. This is why we don't have the mandate to discuss any other issue. If we make progress, then both sides will be in a better position to move forward on other fronts. But for now, we don't want to be distracted". Crisis Group interview, Tehran, March 2014; Laura Rozen, "Iran FM Zarif, meeting Kerry, says not authorized to discuss Syria", Al-Monitor, 2 February 2014.

of the essence, lest political developments derail the process, spoilers disrupt it and politicians who are deeply invested in it lose momentum.¹⁵

A comprehensive agreement on the nuclear issue alone has been likened to a Rubik's cube, a multifaceted puzzle in which moving one piece displaces others and is solved only when all pieces simultaneously fall into place.¹⁶ There is some validity to this metaphor – though negotiators should not allow the perfect to become the enemy of the good, since an ideal alignment is unlikely to materialise. The real measure of a putative agreement is how it measures up against alternatives: either a return to the previous vicious race of sanctions versus centrifuges, with each side ratcheting up its leverage in the hope of forcing the other to capitulate; or a recourse to military force that could set back Iran's nuclear march temporarily but lead it to pursue deadly unconventional retaliation while rushing for a nuclear weapon.

This report outlines the technical challenges for reaching a comprehensive nuclear accord, and proposes concrete compromise solutions, building on the parties' apparent political will for such an agreement. Rather than consider the far-reaching obstacles that obstruct a broader U.S.-Iranian pact and that eventually need to be tackled for multiple reasons, it adopts the parties' minimalist posture of looking narrowly at the immediate technical problems that must be overcome to reach agreement on the nuclear file. It lays out a set of innovative and workable ideas to help the negotiators, beholden as they are to their respective national narratives and political constraints, to overcome the most immediate hurdles.

¹⁵ Iranians worry about the consequences of the November 2014 mid-term and November 2016 presidential elections in the U.S., as the first could increase the Republican Party's control over Congress and further tie President Obama's hands, and the second could bring in a president who might reverse progress made. Crisis Group interviews, Iranian officials, Vienna, February-April 2014. U.S. and European officials are also concerned that President Rouhani's administration could lose ground to hardline factions if they fail to demonstrate quick dividends from their approach. Crisis Group interviews, Geneva, October-November 2013. Foreign Minister Zarif noted: "It will be very hard to sustain the positive momentum, even beyond 20 July". Crisis Group interview, Vienna, 19 February 2014.

¹⁶ "Putting this agreement together will really be like solving a Rubik's cube. We can't look at any one issue in isolation but rather will have to consider what package we can all agree to that will meet the objectives that we have". "Background Briefing", op. cit.

II. The First Step

The circumstances behind the unprecedented breakthrough between Iran and the P5+1 are a subject of conjecture. Many in the West credit strangulating sanctions and their economic toll for altering Tehran's nuclear calculus.¹⁷ As evidence they point to President Hassan Rouhani's pledge during Iran's 2013 presidential campaign to ensure their removal and his admission after assuming office that "the country's coffers were virtually empty".¹⁸

Iran denies any causal link between sanctions and its flexibility at the negotiating table. It argues instead that Washington and Brussels shifted position, abandoning their longstanding demand for zero-enrichment, because of war-weariness, recognition that pressure would not curb the nuclear program¹⁹ and President Obama's desire to leave a positive foreign policy, and especially nonproliferation, legacy.²⁰ An Iranian official noted: "We were always at the table. From 2003 to 2005, in the absence of harsh sanctions, we suspended enrichment. Again, in 2010, we signed an agreement with Brazil and Turkey [regarding a proposal to swap some enriched uranium with nuclear fuel], while sanctions had not reached their high-water mark".²¹

Correcting these oversimplifications is important for avoiding miscalculation. The real constellation of factors that made agreement possible is more nuanced than either side is prepared to admit. First and foremost, the key players seemingly realised that the status quo was unsustainable and that their respective leverage had peaked. Iran's technological advancement had drawn close to Israeli and U.S. redlines, compelling self-restraint lest Tehran provide a *casus belli* for a strike on its installations.²² Western concerns over the sustainability of oil sanctions were heightened,²³

¹⁷ Crisis Group interviews, U.S., UK and European officials, Geneva, Vienna, London, Washington, October 2013-March 2014. President Obama said, "the sanctions that we put in place helped make this opportunity [nuclear deal with Iran] possible". Senator Robert Menendez, a staunch advocate of sanctions, echoed this: "Current sanctions brought Iran to the negotiating table, and a credible threat of future sanctions will require Iran to cooperate and act in good faith at the negotiating table". Obama State of the Union Address, The White House, 28 January 2014; Jim Sciutto, "Senators propose new Iran sanctions bill; White House opposed", CNN, 20 December 2013.

¹⁸ Rouhani has been outspoken about the dire economic situation, remarking early in his term: "When this administration came to office ... the government lacked sufficient revenue to pay public sector salaries We faced major shortages in staple food reserves This year's stagflation was unparalleled since the [1979] revolution ... the economy contracted by 6 per cent, while inflation rose above 40 per cent ... the government's debt to private and public sector entities stood at nearly \$70 billion". "President Rouhani's 100th Day Report", President.ir, 27 November 2013.

¹⁹ An Iranian official said, "the only thing that progressed in Iran under sanctions was the nuclear program". Crisis Group interview, Istanbul, February 2014.

²⁰ Crisis Group interviews, Iranian officials, Istanbul, Tehran, September 2013-March 2014.

²¹ Crisis Group interview, Tehran, March 2014. For background information on the 2003 and 2010 agreements, see Crisis Group Middle East Report N°18, *Dealing with Iran's Nuclear Program*, 27 October 2003; and Middle East and Europe Report N°116, *In Heavy Waters: Iran's Nuclear Program, the Risk of War and Lessons from Turkey*, 23 February 2012.

²² A political analyst in Tehran asked: "How long can Iran enrich to 20 per cent level, while still staying below Netanyahu's 250kg redline or refrain from operating hundreds of installed, but idle, centrifuges?" Crisis Group telephone interview, 21 August 2013. Estimates suggested that by mid-2014, Iran could enrich uranium to weapons-grade without detection. Terry Atlas, "Iran Seen Able to Process Bomb-Grade Uranium Next Year", Bloomberg, 31 July 2013.

²³ Even before Rouhani's election, U.S. officials monitoring Iran's petroleum sales observed that the initial shock of oil sanctions was beginning to wane. Crisis Group interview, Washington, 13 February 2013. A European diplomat noted: "I am afraid if we fail to cash in the sanctions soon, they could

particularly after Rouhani's election and his apparently successful international charm offensive.²⁴ Too, both sides realised that prolonging the stalemate risked eroding their positions. After initially underestimating sanctions,²⁵ the Iranian leadership was taken aback by their effectiveness, which, compounded by systemic mismanagement, prompted substantial discontent among important segments of the polity and society.²⁶ Western policymakers realised sanctions had crippled Iran's economy but not the nuclear program.²⁷

Each side also exaggerated the desperation it ascribed to the other. Neither Rouhani's election nor his government's more flexible nuclear stance could be attributed wholly to sanctions. His upset victory above all was the result of eleventh-hour political manoeuvres by his allies and a well-run campaign.²⁸ The economy was suffering mightily but was not on the verge of collapse;²⁹ even were it, the leadership views surrendering to sanctions as more perilous than suffering their consequences.³⁰ Other strategic, geopolitical and even personal calculations also were likely at play in Tehran's nuclear shift.³¹

Similarly, Iran erred in its belief that Western war-wariness was dispositive. The U.S. and its European allies indeed are reluctant to confront Iran militarily, but in

start to lose their value". Crisis Group interview, Istanbul, 9 October 2013. "عبور ایران از تحریم بانک مرکزی، غرب را پای میز مذاکره کشاند [Iran's skirting of the Central Bank sanctions brought the West to the negotiating table]", Mehr News Agency, 17 April 2014.

²⁴ For examples of the multipronged charm offensive, see "Israelis bewildered by Iranian president's Rosh Hashanah greeting", Reuters, 7 September 2013; Hassan Rouhani, "Why Iran seeks constructive engagement", *The Washington Post*, 20 September 2013; Javad Zarif, "Iran's Message: There Is A Way Forward"; video, 19 November 2013, <http://youtu.be/Ao2WH6GDWz4>. The result was, as a visibly satisfied Iranian official put it, "a complete change in Iran's global image in a matter of a few weeks". Crisis Group interview, Istanbul, 1 November 2013. A senior Iranian official said, "with its inflammatory rhetoric, the previous Iranian government was doing the bidding for our foes and had rendered pressure [on] Iran cost-free. That era is over now". Crisis Group interview, New York, 21 September 2013.

²⁵ An Iranian scholar said, "faced with the prospects of draconian sanctions, the leadership hoped for the best and never prepared for the worst". Crisis Group interview, Tehran, March 2014; "Ahmadi-nejad calls U.N. nuke sanctions 'worthless paper'", Associated Press, 11 June 2010.

²⁶ Dissatisfaction with Tehran's negotiating strategy was vividly displayed during the 2013 election campaigns. For background, see Crisis Group Briefing, *Great Expectations*, op. cit.

²⁷ Crisis Group interviews, Istanbul, Washington, October 2013-March 2014. Foreign Minister Zarif argued: "When sanctions started, Iran had less than 200 centrifuges. Today Iran has 19,000 centrifuges; so the net product of the sanctions has been about 18,800 centrifuges". "Zarif: Sanctions have utterly failed", Al Jazeera, 3 December 2013. Iranians often emphasise that sanctions have harmed the West too. In the wake of the Ukraine crisis, a senior official expressed *Schadenfreude*: "Europe deprived itself of Iranian natural gas and is now powerless in the face of Moscow's annexation of Crimea". Crisis Group interview, Tehran, March 2014.

²⁸ Tehran University Professor Mohammad Marandi noted: "People tend to forget that Rouhani barely cleared the majority needed to seal a victory and avoid a runoff". Crisis Group interview, Tehran, 16 March 2014. For background, see Crisis Group Briefing, *Great Expectations*, op. cit.

²⁹ "Compared to Greece and Spain, Iran's economy is in a better place". Crisis Group interview, Djavad Salehi Isfahani, Virginia Tech professor, Washington, 8 February 2014. A former Obama administration official said, "the nuclear clock was ticking much faster than the economic clock. Iran would have passed the nuclear finish line before its economy would have collapsed". Crisis Group telephone interview, Washington, February 2014.

³⁰ Crisis Group interviews, Iranian officials, Istanbul, August-December 2013.

³¹ An Iranian analyst opined: "The Supreme Leader is in his mid-70s. He does not wish to leave behind a country that is economically frail and internationally isolated, but has an advanced uranium enrichment program". Crisis Group interview, Istanbul, November 2013.

the absence of real diplomatic progress and in the event of provocative behaviour, the pressure to act militarily might yet prove overwhelming. Another military action in the Middle East may be unimaginable for many in Washington and Brussels – but so too is permitting Iran to cross the nuclear weapons threshold.³² By the same token, advocates of sanctions remain unconvinced that they have run their course and even seek to ratchet them up.³³

Nevertheless, probably never before had there been so much political will among so many on both sides,³⁴ and a clear channel for communicating it,³⁵ than in the run-up to the Geneva agreement. Whether it will be sufficient to overtake lingering misperceptions remains to be seen.

A. *The Road to Geneva*

After a six-month hiatus – largely the result of Iran's presidential election – talks resumed in September 2013. The first meeting, on the margins of the UN General Assembly, was unprecedented. Convened at the ministerial level and concluded with a 30-minute tête-à-tête between the U.S. Secretary of State and his Iranian counterpart,³⁶ the meeting set the tone for the renewal of negotiations.³⁷

Three weeks later, substantive discussions commenced in Geneva. In the first plenary, Iran's foreign minister put forward a new framework that defined a common objective, outlined how to address the parties' most urgent concerns and sketched the

³² "If the nuclear program is an issue of national pride for Iran, preventing Iran from acquiring a nuclear weapon is an issue of national pride for the U.S.". Crisis Group interview, U.S. official, Washington, 22 August 2013.

³³ Four days before Rouhani's inauguration, the U.S. House of Representatives overwhelmingly voted sanctions that would have virtually imposed an oil embargo on Iran. Rick Gladstone, "Sending Message to Iran, House approves tougher sanctions", *The New York Times*, 31 July 2013.

³⁴ Obama's threat to veto any new sanctions against Iran was a testament to unprecedented U.S. investment in nuclear diplomacy. "Obama threatens to veto Iran sanctions bill", *The Washington Post*, 28 January 2014. The same applied to Iran. Crisis Group interviews, Istanbul, Geneva, Prague, Tehran, October 2013-March 2014. A UK official said, "the main reason we have been able to move so quickly is political will on all sides". Crisis Group interview, London, 15 November 2013.

³⁵ Since 2012, Oman had facilitated confidential meetings between Iranian and U.S. officials. These led to higher-level encounters in spring 2013. A total of twelve meetings took place; those before Rouhani's election convinced both sides that a deal was possible, while those after his election laid the ground work for the Geneva agreement. Crisis Group interviews, former U.S. official, Washington; Omani scholar, Muscat, December 2013. See Laura Rozen, "Burns led secret US back channel to Iran", *Al-Monitor*, 24 November 2013; Benjamin Barthe, "Le sultanat d'Oman a joué un rôle discret de courtier entre les Etats-Unis et l'Iran", *Le Monde*, 20 December 2013. The Sultan of Oman also delivered an Obama message to Tehran pledging to remove the sanctions in case of a nuclear deal. A senior Iranian official noted: "We have to take the U.S. President at his word". Crisis Group interview, New York, September 2013. In addition to the confidential track, unprecedented public contacts also occurred. Josh Lederman and Nedra Pickler, "Historic phone call, then optimism for US, Iran", *Associated Press*, 28 September 2013.

³⁶ Anne Gearan, "Kerry, Iranian foreign minister Zarif hold private meeting on sidelines of nuclear talks", *The Washington Post*, 26 September 2013; "Iran nuclear: 'Shift in Tehran tone' hailed at UN", *BBC News*, 27 September 2013.

³⁷ Zarif suggested merging Iran's preferred approach (clarifying the endgame from the outset) with that of the P5+1 (focusing on a first confidence-building step) into a single roadmap, starting with the latter and ending with the former. Crisis Group interviews, Iranian and American officials, New York, 26 September 2013. In Zarif's words, "the long-term perspective will give both sides courage to move forward. The interim measures will help us to keep the momentum and remove the obstacles". Crisis Group interview, New York, 21 September 2013.

contours of a final agreement.³⁸ At Iran's request, all agreed to keep the substance of the negotiations confidential.³⁹ The final joint statement – the issuance of which itself was a rarity – made clear that the P5+1 accepted Iran's proposed framework as the basis for talks.⁴⁰ The workmanlike atmosphere prompted optimism. In the words of a British official, "the substance is exactly the same as before, but the style could not be more distinct. Instead of polemic and diatribes, there was focused dialogue".⁴¹ A U.S. diplomat noted: "After all these years, we are finally bargaining, in the real sense of the word".⁴²

Detailed discussions began during the second meeting, on 7-9 November. Expectations of an imminent breakthrough peaked when the P5+1's foreign ministers unexpectedly descended on Geneva.⁴³ But the diplomatic push hit a snag, purportedly because of last-minute revisions to the text that were unacceptable to the Iranians.⁴⁴ The parties decided to meet again in ten days, after more consultations with their capitals that reestablished momentum. Both sides swiftly and concretely reaffirmed their commitment to diplomacy: Iran signed the "Framework for Cooperation" with

³⁸ Crisis Group interview, Iranian official, Geneva, 15 October 2013. The proposal's title, "Closing an Unnecessary Crisis, Opening New Horizons", was a familiar theme for Zarif. "An Unnecessary Crisis: Setting the Record Straight about Iran's Nuclear Program", *The New York Times*, 18 November 2006; Joby Warrick, "Iran opens nuclear talks with proposals to end 'unnecessary crisis' over its atomic program", *The Washington Post*, 15 October 2013.

³⁹ The decision arguably aimed at shielding the process from domestic and regional pressures. Crisis Group interviews, Iranian analysts and journalists, Geneva, 16 October 2013 "Hardline newspaper report sends Iran foreign minister to hospital", Reuters, 9 October 2013; Scott Peterson, "Nuclear talks secrecy allows Iran's hard-liners to argue US has upper hand", *Christian Science Monitor*, 21 October 2013.

⁴⁰ Joint Statement by EU High Representative Catherine Ashton and Foreign Minister of Iran Mohammad Javad Zarif, Geneva, EU External Action Service, 16 October 2013.

⁴¹ Crisis Group interview, London, 14 November 2013.

⁴² Crisis Group interview, Geneva, 16 October 2013; James Blitz, "US signals possible agreement with Iran after Geneva talks", *The Financial Times*, 16 October 2013.

⁴³ A former U.S. official said, "the P5+1's political directors felt they were very close to a deal, with a basic draft agreed and some bracketed language. Thus, the foreign ministers arrived to sign the dotted line". Crisis Group interview, Washington, November 2013.

⁴⁴ Speculation about the exact nature of the disagreements abounded. Reportedly, France rejected even an implicit recognition of enrichment in Iran and demanded that the heavy-water reactor in Arak be shut down. "Last-minute rethink stalled deal on nuclear Iran", *The Guardian*, 11 November 2013. For Iran, the former was unacceptable, and the latter ought not to be an imminent concern. Arguing that the "the reactor is nowhere near completion", a senior Iranian official said, "this is not an appetiser. It should be left for the main course". Crisis Group interview, Geneva, 22 November 2013. A senior French official said that his country's role had been overstated. "The text was full of brackets. We made important contributions on Arak, but other countries improved the text on centrifuges and other matters". Crisis Group interview, Washington, December 2013; "Iran media highlight France's 'obstruction'", BBC, 10 November 2013. Some attributed the rigid posture to the outsize power of the non-proliferation bureau at the French foreign ministry. Crisis Group interview, French diplomat, Cairo, 13 November 2013. Others felt it was a reaction to "a perception of being left out and presented with an Iranian-American *fait accompli*, hence President Obama's phone call to President [François] Holland". Crisis Group telephone interview, U.S. official, 20 November 2013; "Hollande et Obama unis sur le dossier iranien", *Tribune de Genève*, 13 November 2013. Failure to reach a deal prompted a public blame game. "Nucléaire iranien: Laurent Fabius se méfie d'un 'jeu de dupes'", *lexpress.fr*, 11 November 2013; Robert Mackey, "Iran's Foreign Minister Subtweets Kerry", *The New York Times*, 11 November 2013; "Kremlin: Haste wasted Iranian nuclear talks", United Press International, 14 November 2013.

the IAEA to address “all present and past issues”⁴⁵ and, more importantly, demonstrated flexibility on its persistent demand for recognition of what it calls its “right to enrichment”.⁴⁶ The Obama administration pushed back with unprecedented vigour against Congressional plans for additional Iran sanctions.⁴⁷

The negotiators reconvened in Geneva on 20 November, determined to clinch the elusive accord. After three days of intense negotiations – mostly over semantics⁴⁸ – the deal was reached.

B. *A Breakthrough onto Thin Ice*

The accomplishment quickly was revealed to be as precarious as it was momentous. In selling the deal to their home fronts, each side hailed the agreement as a unilateral victory for itself and concession by the other. Iran highlighted an acknowledgement of uranium enrichment on its soil and hailed the agreement as a “surrender to the Iranian people’s will” and the “meltdown of the sanctions iceberg”.⁴⁹ The U.S. emphasised halting Iran’s most sensitive nuclear activities; claimed that Iran “will even be deeper in the hole” after the deal; and that “all options remain on the table”. The lack of diplomatic decorum provided ammunition for the deal’s critics, breeding rancour and mistrust.⁵⁰

⁴⁵ This was the first agreement between Iran and the agency since 2007. In the six-point annex, Iran promised to provide within three months managed access to its Gchine mine and heavy water production plant in Arak; give information on all new research reactors and sites designated for the future construction of nuclear plants; and clarify plans for building additional enrichment facilities and for laser enrichment technology. “IAEA, Iran Sign Joint Statement on Framework for Cooperation”, IAEA, 11 November 2013. The IAEA report showed that Iran had slowed its nuclear progress to a crawl since Rouhani’s inauguration. For unclear reasons, the U.S. Treasury halted blacklisting Iranian entities during the same period. See Fredrik Dahl, “No big change in Iran nuclear work under Rouhani: IAEA”, Reuters, 13 November 2013; Eli Lake and Josh Rogin, “Obama’s Secret Iran Détente”, DailyBeast.com, 8 November 2013.

⁴⁶ Zarif announced: “Not only do we consider that Iran’s right to enrichment [is] unnegotiable, but we see no need for that to be recognized as ‘a right’, because this right is inalienable and all countries must respect that”. “Iran points to possible way round nuclear sticking point”, Reuters, 17 November 2013.

⁴⁷ The Obama administration went as far as equating the push for additional sanctions with a “march to war”. “New Iran sanctions would risk war, White House warns”, Agence France-Presse, 12 November 2013.

⁴⁸ In the final hours before the deal was struck, a senior Iranian official said, “the remaining obstacles are not insurmountable. They are mostly about semantics. It makes a huge difference to say that the comprehensive solution ‘could’ or ‘should’ or ‘will’ include enrichment on Iran’s soil”. Crisis Group interview, Geneva, 22 November 2013. Later an Iranian negotiator admitted the reason talks concluded at 3am was discord over the exact wording on enrichment. See “بعیدی نژاد: لغو تمامی تحریم ها به “چند سال زمان نیاز دارد” [“Baeidinejad: Lifting of all sanctions will take a few years”], IRdiplomacy.ir, 19 January 2014.

⁴⁹ See “Rouhani: World powers recognized Iran enrichment right”, Press TV, 24 November 2014. Hossein Mousavian, Rouhani’s former deputy said, “the P5+1’s *volte-face* on the issue of enrichment, allowing Iran to retain a limited enrichment program, was the most instrumental factor that made the deal possible”. Crisis Group interview, Istanbul, 21 February 2014. “Iran nuclear deal means ‘surrender’ for Western powers, says Rouhani”, Associated Press, 14 January 2014; “صالحی: “کوه یخ تحریم ها در حال فرو ریختن است” [“Salehi: The sanctions iceberg is melting”], Mehr News Agency, 20 January 2014.

⁵⁰ “Statement By The President On First Step Agreement On Iran’s Nuclear Program”, The White House, 23 November 2013. David Cohen, under secretary of the treasury for terrorism and financial intelligence, wrote: “Iran’s economy will also continue to suffer because the core architecture of

Opponents of the agreement found plenty to criticise. In both Iran and the U.S., hardliners called their government's concessions disproportionate;⁵¹ some went so far as to demand reopening the agreement.⁵² But the most vociferous criticism came from Israel's prime minister. Even before the accord was reached, Benjamin Netanyahu labelled it the "deal of the century for Iran" and compared it with the serially-violated 2007 nuclear deal with North Korea.⁵³ Later, he termed it "a historic mistake".⁵⁴ In advance of the deal, the main Israeli objection was that removing any brick from the carefully constructed sanctions edifice would encourage many around the world to rush back to Iran's potentially lucrative market, which inevitably would unravel the painfully constructed sanctions regime and allow Tehran to enjoy the benefits of a final deal (sanctions relief) without having to pay its cost (a far more significant halt to the nuclear program).⁵⁵

Israel also lamented that by permitting continuation of enrichment, in spite of six UN Security Council resolutions mandating suspension, the accord in essence legitimised Tehran's nuclear program.⁵⁶ It preferred that the P5+1 drop the idea of an in-

U.S. sanctions – especially our potent oil, financial and banking sanctions – remains firmly in place. The oil sanctions alone cost Iran about \$5 billion a month in lost sales, meaning that over the six-month duration of the Joint Plan, Iran will lose about \$30 billion in oil revenue". "We're Not Easing Sanctions on Iran", *The Wall Street Journal*, 10 December 2013. An Iranian official reacted: "It seems that even some within the Obama administration oppose the agreement". Crisis Group interview, December 2013. But Kerry echoed the same line: "There's very little sanctions relief here – the basic architecture of the sanctions stays in place". Quoted in "Kerry says Iran deal will make Israel safer over next six months", Reuters, 24 November 2013. Obama threatened to "come down like a ton of bricks" on firms that violate Iran sanctions. "Obama: Sanction violators face US 'ton of bricks'", Associated Press, 11 February 2014. Alireza Miryousefi, "Kerry, Obama rhetoric threatens to derail diplomacy", *Christian Science Monitor*, 3 February 2014. Troubled by the consequences, a U.S. official said, "some people in Washington forget that the Iranians read English", Crisis Group interview, December 2013.

⁵¹ For a sample, see "توافق نامتوازن ژنو با توقف غنی‌سازی 20 درصد کلید خورد" ["The disproportionate Geneva deal launched with the halt of 20 per cent enrichment"], *Kayhan*, 20 January 2014; "Senator Schumer: Iran wins in nuclear agreement", *The Hill*, 24 November 2013.

⁵² See Mitchell Reiss and Ray Takeyh, "Don't Get Suckered by Iran", *Foreign Affairs* (online), 2 January 2014; "آن سوی اشک‌ها و لیخندها" ["Beyond the sound of music"], *Kayhan*, 12 January 2014.

⁵³ "Israel PM Netanyahu criticises Iran 'deal of the century'", BBC, 8 November 2013.

⁵⁴ Israelis did not have a monolithic view. While some warned of apocalyptic consequences, others were more optimistic. Naftali Bennett, trade and industry minister, said, "if in five years a nuclear suitcase explodes in New York or Madrid, it will be because of the agreement that was signed this morning". William Booth, "Israel's Netanyahu calls Iran deal 'historic mistake'", *The Washington Post*, 24 November 2013. But President Shimon Peres and some former military and intelligence officials welcomed the deal. "Peres on Iran deal: Alternative is worse, more difficult", Ynetnews.com, 24 November 2013; "Unlike Netanyahu, retired generals go along with Iran deal", United Press International, 26 November 2013.

⁵⁵ Crisis Group interview, Israeli officials, Washington, Tel Aviv, August 2013-January 2014. A pro-Israel U.S. lobbyist said, "it is all about psychology. When you take away the stigma, sanctions turn into an empty shell". Crisis Group telephone interview, November 2013. Highly inflated forecasts about the monetary benefit of the JPOA for Iran underpinned these arguments. See "Steinitz: Sanctions relief worth up to \$40 billion to Iran", Reuters, 13 November 2013. Western officials dismissed these forecasts as exaggerations. Crisis Group interviews, U.S. and UK officials, Geneva, 22 November 2013.

⁵⁶ While Iranian negotiators boasted about the weakening of the UN Security Council resolutions as an achievement, two former U.S. secretaries of state underlined it as one of the JPOA's main shortcomings. See "عراقچی: توافق ژنو قطعنامه‌های شورای امنیت را به شدت تضعیف می‌کند" ["Araghchi: The Geneva agreement significantly weakens the UN Security Council resolutions"], BBC Persian, 2 December

terim deal and use its leverage, including a “credible military threat” to impose a solution that would address concerns once and for all.⁵⁷

Many in the U.S. Congress – the acquiescence of which was needed, lest it undermine negotiations – shared these views. Persuaded that economic pressure alone was responsible for bringing Iran to the table and tightening them was the only way to yield real concessions, some lawmakers were loath to see sanctions alleviated.⁵⁸ Important Middle Eastern stakeholders, such as Saudi Arabia, related to these concerns and worried that a single-minded U.S. focus on a nuclear bargain would free Iran to pursue a more aggressive regional policy.⁵⁹

Such apprehensions were mirrored in Tehran, where sceptics worried that a conciliatory approach could be misinterpreted as weakness, invite more pressure and deprive Iran of strategic bargaining chips, while leaving the sanctions regime intact.⁶⁰ Public criticism was initially muted, due to the Supreme Leader's support for the negotiating team, but grew louder following the JPOA's implementation.⁶¹

Substantively, criticism focused on the provision that tied Iran's enrichment to civilian needs; the requirement that the two be proportional, opponents feared, could shrink the nuclear program to irrelevance should civilian needs be otherwise satisfied.⁶² Critics also expressed concern that the sanction relief was disproportionately minor and reversible, which they interpreted as evidence that the agreement was a

2013; Henry Kissinger and George Shultz, “What a Final Iran Deal Must Do”, *The Wall Street Journal*, 2 December 2013.

⁵⁷ Crisis Group interviews, U.S. and Israeli officials, Washington, October-December 2013. “As nuclear talks commence, Congress urges Obama to keep pressure on Iran”, Reuters, 15 October 2013.

⁵⁸ For a collection of statements from the members of Congress, see “Geneva Deal IV: Congressional Reaction”, Iran Primer, United States Institute of Peace, 24 November 2013.

⁵⁹ Although the Kingdom officially welcomed the deal, senior Saudi princes subsequently reprimanded the West. See “Saudi Arabia welcomes Iran nuclear agreement”, Al Jazeera, 25 November 2013; Jay Solomon, “Saudi Royal Blasts U.S.'s Mideast Policy”, *The Wall Street Journal*, 15 December 2013; Mohammed bin Nawaf bin Abdulaziz al Saud, “Saudi Arabia Will Go It Alone”, *The New York Times*, 17 December 2013. Reactions from other countries in the region were mixed. See “One agreement, wildly different reactions”, CNN, 24 November 2013.

⁶⁰ Crisis Group interviews, Iranian analysts and former officials, Geneva, Istanbul, November-December 2013. In the words of Hossein Shariatmadari, the editor of the ultra-conservative *Kayhan* newspaper, “The identity of both sides is involved in this conflict It is structural. The problem will be solved when one side gives up its identity, only then”. Quoted in David Ignatius, “Iran's hard-liners resist nuclear deal”, *The Washington Post*, 17 December 2013.

⁶¹ In the run-up to the Geneva accord, by talking about the occasional necessity of “heroic leniency” and calling the nuclear negotiators “children of the revolution”, Ayatollah Khamenei provided unprecedented support for the nuclear talks. Najmeh Bozorgmehr, “Iran's supreme leader pushes for flexibility in nuclear talks”, *The Financial Times*, 17 September 2013; “رفسنجانی: اگر حمایت رهبری از “ مذاکرات نبود، افراطی‌ها اجازه کار نمی‌دادند [“Rafsanjani: Without the Leader's support, the radicals would have blocked the process”], Khabaronline.ir, 7 December 2013. Mohammad Ali Jafari, the commander of the powerful Islamic Revolutionary Guards Corps, said that although Iran had not crossed its own redlines in the JPOA, it had “given the maximum and received the minimum”. See Thomas Erdbrink, “Military Chief in Iran Scolds a Top Official”, *The New York Times*, 11 December 2013; and “IRGC Commander: We grudgingly remain silent about the negotiations”, BBC Persian, 19 February 2014; Simon Tisdall, “Hassan Rouhani faces growing criticism in Iran over nuclear talks”, *The Guardian*, 4 May 2014.

⁶² “A brief criticism of the JPOA's substance”, Irannuc.ir, 25 November 2013.

ploy to keep restrictions in place indefinitely.⁶³ Some believe the Supreme Leader is tolerating vocal criticism of the Rouhani administration's stewardship of the nuclear talks as a tactical manoeuvre to improve Tehran's negotiating position;⁶⁴ others argue that the discord is real and has been exacerbated by a charged political atmosphere in advance of two crucial elections in 2016, for parliament and the Assembly of Experts (the body charged with selecting the Supreme Leader's successor).⁶⁵

Fears on both sides were mostly exaggerated. True, the Iranian economy benefited from a bounce, and many Western firms put out feelers,⁶⁶ but the sanctions remained robustly in place, as did their rigorous enforcement and chilling effects on trade.⁶⁷ Many companies, afraid of unwittingly crossing a redline and cognisant of the short

⁶³ Crisis Group telephone interviews, former Iranian officials, Tehran, November-December 2013; "رمزگشایی از ابهامات توافق نامه ژنو" ["The Geneva Agreement's Ambiguities Decoded"], Basij Of Masoumeh Seminary, 28 December 2013.

⁶⁴ A Tehran University professor said, "the system has nothing to lose by showing to the West, particularly the U.S., that the Iranians have their own 'Tea Party'. The message they are conveying is that if you fail to deal with the moderates, you will have to deal with the hardliners". Crisis Group telephone interview, Tehran, January 2014.

⁶⁵ Crisis Group telephone interviews, Davoud Hermidas-Bavand, political analyst, Tehran, 5 February 2014; Hossein Mousavian, former Iranian nuclear negotiator, Istanbul, 21 February 2014. As suggested by President Rouhani, some Iranian stakeholders' vested economic interest in the continuation of sanctions could be another factor. "Iran's Rouhani suggests critics benefited from sanctions", Reuters, 29 April 2014. Some conservatives have already alleged that the U.S. is planning a "soft revolution" by trying to shape Iran's political landscape through the nuclear talks. See Mehdi Mohammadi, "صورت مسئله واقعی در مذاکرات هسته ای چیست؟" ["What is at the crux of nuclear negotiations?"], *Vatan Emrooz*, 24 February 2014. But a nuclear deal would not necessarily consolidate the so-called Iranian moderates. As an analyst in Tehran put it, "if the moderates score a victory on the nuclear file, the conservatives will shift the arena of competition to other issues (eg, the economy and socio-political reform)". Crisis Group interview, Tehran, March 2014. A former official said, "the best deal for the Iranian hardliners is a bad deal, because it falls short of a breakdown in the talks that could put the state's security at risk, while it opens the way to blaming and shaming the government". Crisis Group interview, Istanbul, February 2014.

⁶⁶ Both the Geneva deal and its implementation boosted Iran's currency against the dollar. See "Iran currency jumps over 3 per cent after nuclear deal", Reuters, 24 November 2013; "Iran's Rial Strengthens after Implementation of Nuclear Accord", Fars News Agency, 21 January 2014. Ironically, Tel Aviv's stock market also hit a record high in the wake of the accord. "Israeli markets gain, investors say Iran deal not a mistake", Reuters, 24 November 2013. The number of Western trade delegations that visited Iran in the first two weeks of January 2014 was more than in the entire year of 2013. See "رقابت داغ اروپا و امریکا بر سر ایران" ["Heated competition between Europe and America over Iran"], *Khabaronline.ir*, 29 January 2014; Susanne Koelbl, "'Chance of a Century': International Investors Flock to Tehran", *Der Spiegel*, 2 January 2014.

⁶⁷ When dealing with Iran, foreign firms continue to feel bound to take extra precautions that affect even permissible trade. Benoit Faucon, "Tanker Insurers Warn on Iran Shipments", *The Wall Street Journal*, 14 February 2014; Jonathan Saul and Parisa Hafezi, "Western banks cold-shoulder Iran trade finance scheme", Reuters, 13 March 2014; Ramin Mostaghim and Paul Richter, "In Iran, nuclear deal brings little economic relief", *The Los Angeles Times*, 7 April 2014. Even Israeli diplomats, who argued the deal would undermine the sanctions regime, agree. "The Iranians ultimately did not sense a particularly significant economic reprieve. If you look at Iran's economy today, you quickly see that fuel and bread costs are about to rise, as are prices in general". Crisis Group interview, Jerusalem, 13 April 2014. A European official said, "it will be foolish to let our main bargaining chip slip out of our hands before we have a final deal with Iran". Crisis Group interview, Istanbul, 20 January 2014. The U.S. Treasury and Congress continued to warn against a premature rush to Iranian markets, and penalties were imposed on a few sanctions evaders. "US says businesses should be 'cautious' over Iran", BBC, 23 January 2014; for a complete list of enforcement actions taken, see www.treasury.gov/ofac/enforcement.

window of sanctions relief under the JPOA, decided not to take chances.⁶⁸ Thus, Tehran's efforts to lure international business appeared more as an effort to gain allies for further reducing sanctions in the future than a bid to lock down immediate trading partners.⁶⁹ The recovery of the economy was arguably as much – if not more – due to relatively sound stewardship, as well as a harsh winter that boosted demand for Iran's oil.⁷⁰

Some in both capitals preferred jumping straight to a more comprehensive, long-term deal, but the parties' widely divergent perspectives ruled this out as a first step. The same was true of a deal addressing Iran's regional policies, which would require involving regional players and an inevitably protracted process. In the absence of any agreement, the escalatory cycle would have continued and Iran's nuclear program almost certainly would have accelerated, leaving the P5+1 with the unenviable choice of either acquiescing or moving toward a military confrontation with unpredictable and dangerous consequences. Under the circumstances, the Geneva agreement was the best option.

⁶⁸ An oil executive said, "Iran's potential is enormous, and we obviously want to be ahead of the curve. But everyone is in the wait-and-see mode for now". Crisis Group interview, London, 15 November 2013. An Iranian businessman said, "no one is signing anything. Western companies are interested, but for now what they are doing is preparatory at best, exploratory at worst". Crisis Group interview, Istanbul, 10 January 2014. Another entrepreneur opined: "Iran today is like a giant shopping mall, flocked with prospective clients who are just window-shopping". Crisis Group telephone interview, Tehran, 18 January 2014. U.S. officials later confirmed these observations. See Patricia Zengerle, "Treasury official: Firms not in new deals with Iran after pact", Reuters, 2 April 2014; Rick Gladstone, "Sanctions Are Eased; Iran Sees Little Relief", *The New York Times*, 13 April 2014.

⁶⁹ An Iranian energy expert explained: "The Iranians are not naïve and know that lifting the sanctions is going to be a drawn-out process. But given that Tehran has no effective lobbying influence in Western capitals, it wants the weight of oil giants on its side". Crisis Group interview, Istanbul, 2 November 2013. Tara Patel and Francine Lacqua, "Iran to woo oil companies with 'sexy' contracts, Total CEO says", Bloomberg, 24 January 2014.

⁷⁰ Compared to 2013, consumer prices rose 23 per cent in February 2014, down from 45 per cent in June 2013. Dana El Baltaji, "Iran Inflation Slows to Two-Year Low, Fulfilling Rouhani Pledge", Bloomberg, 30 March 2014; "Iran's economy to come out of recession in 2014: IMF", *Tehran Times*, 9 April 2014. For an overview of economic mismanagement under the previous Iranian government, see "خلاصه تحولات اقتصادی کشور سال 1391" ["Summary of Iran's economic developments in 2012"], The Central Bank of Iran, March 2014. A prominent Iranian economist said, "the improvement is partly the result of an improved market psychology, which is now less apprehensive about erratic economic dictate; and partly due to the new administration's efforts to stabilise the currency, stem the tide of liquidity, tame corruption and cut waste". Crisis Group interview, Istanbul, 7 March 2014; Anthony DiPaola, "Iran Monthly Oil Exports Rise as Demand Spurs Output, IEA Says", Bloomberg, 13 February 2014.

III. Journey of A Thousand Miles

A. From Geneva to Vienna

Negotiations aimed at hammering out implementation of the JPOA lasted nearly two months. Iran's introduction of a new advanced centrifuge during that time proved particularly contentious.⁷¹ In the meantime, the agreement threatened to collapse when U.S. senators introduced legislation – on the logic that it would pressure Iran to fully implement the JPOA – that would have mandated new sanctions in the event of the agreement's breach and set high standards for the comprehensive accord.⁷² These obstacles were overcome, however, when President Obama's veto threat compelled a significant number of Democratic co-sponsors to withdraw their support.⁷³ The parties agreed on an implementation non-paper, and the deal struck in Geneva came into effect on 20 January 2014.⁷⁴ Monthly since then, the IAEA has confirmed Iran's compliance with its side of the bargain.⁷⁵

Negotiations toward a comprehensive agreement started on 18 February in Vienna. In a show of unity, the P5+1 divided among themselves the six main issues identified in the JPOA, with each presenting the group's position on one.⁷⁶ Tensions surfaced in the first plenary over Iran's ballistic missile program.⁷⁷ Once again, the parties over-

⁷¹ Crisis Group interviews, Iranian and European officials, Vienna, 19 February 2014. Iran informed the IAEA that it will begin testing the new IR-8 model on 4 December 2013. See "Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions in the Islamic Republic of Iran", report by director general, IAEA, GOV/2014/10, 20 February 2014. "صالحی: "سانتریفیوژ های جدید ایران ۱۵ برابر سانتریفیوژ های نسل اول قدرت دارد" [Salehi: Iran's new centrifuges are 15 times more powerful than the first generation centrifuges], Fars News Agency, 10 February 2014.

⁷² The advocates of the bill argued that it would serve as a "diplomatic insurance policy" by clarifying the consequences of breaching the agreement for Iran. Robert Menendez, "A diplomatic insurance policy against Iran", *The Washington Post*, 10 January 2014; Nuclear Weapon Free Iran Act, S.1881, U.S. Senate. A senior U.S. official protested: "We cannot just keep on piling up sanctions without convincing the world to enforce them. There is no scenario in which this regime capitulates as a result of more sanctions. There is simply no parallel universe with an alternative course of action". Crisis Group telephone interview, Washington, 20 November 2013. Also see "Looking to a comprehensive nuclear agreement with Iran: assessing claims and counterclaims over new sanctions", *The Iran Project*, 18 February 2014. Zarif warned that if new sanctions were to pass, "the entire deal is dead. We do not like to negotiate under duress". See Robin Wright, "Iran's Foreign Minister Says Sanctions Would Kill Nuclear Deal", *Time Magazine*, 9 December 2013. The Iranian parliament also pledged to retaliate with a bill requiring the government to enrich uranium to 60 per cent for use in future submarines. Ramin Mostaghim and Paul Richter, "Iran threatens counter measure to Senate's proposed new sanctions", *The Los Angeles Times*, 20 December 2013. The text of the bill is at www.tasnimnews.com/Home/Single/234831.

⁷³ Rebecca Shabad, "After veto threat, senators back off on Iran", *The Hill*, 29 January 2014.

⁷⁴ "Iran nuclear: Curbs on uranium enrichment begin", BBC, 20 January 2014; "Iran sanctions eased as deal sticks", *The Financial Times*, 20 January 2014. Details of the implementation agreement remained confidential, but the White House published a "Summary of Technical Understandings Related to the Implementation of the Joint Plan of Action on the Islamic Republic of Iran's Nuclear Program", 16 January 2014.

⁷⁵ Carole Williams, "IAEA chief: Iran complying with nuclear scale-down commitments", *The Los Angeles Times*, 16 April 2014. The latest IAEA report is "Status of Iran's Nuclear Programme in relation to the Joint Plan of Action", Report by director general, GOV/INF/2014/10, 17 April 2014.

⁷⁶ Crisis Group interview, senior Iranian official, Tehran, March 2014.

⁷⁷ A senior Iranian official rejected any link between the nuclear and missile programs, warning "these talks will go nowhere if the P5+1 reinterprets the JPOA or brings extraneous issues to the table". Crisis Group interview, Vienna, 19 February 2014. A European official said misunderstand-

came the obstacles, settling on a framework and timetable for the talks.⁷⁸ With their bilateral discussions routinised in the framework of the P5+1 meetings, Iran and the U.S. apparently have ceased parallel, secret talks.⁷⁹

Following an expert-level meeting, the second round was held on 17-19 March in Vienna. The sides had substantive discussions on several key subjects, despite the escalating animosity between Russia and the Western members of the P5+1 over Ukraine.⁸⁰ The parties met again on 3-5 and 7-9 April for a third round of technical and political discussions, respectively, to finalise discussions on the remaining issues. Their May sessions are meant to continue to narrow the gaps and begin to draft an agreement.⁸¹

B. *The Seven Hurdles*

At least seven substantive stumbling blocks stand in the way of a comprehensive nuclear accord. Since the JPOA makes clear that “the comprehensive solution would constitute an integrated whole where nothing is agreed until everything is agreed”, disagreement on any of the seven obstacles – or a host of others – could prevent any part of the final step from taking effect.⁸²

1. Uranium Enrichment Capacity

For a dozen years, uranium enrichment has been at the crux of Iran's standoff with the West, with the former insisting on maintaining it, in some form, and the latter seeking to abolish it in any form. With the Geneva agreement, the P5+1 accepted that any plausible, durable deal would involve Iran maintaining some enrichment

ings were caused by ambiguities in the JPOA. “It was hard to be simultaneously broad in determining the contours of the final deal and specific in defining its elements”. Crisis Group interview, Vienna, 19 February 2014.

⁷⁸ Steven Erlanger, “Iran and 6 Powers Agree on Terms for Nuclear Talks”, *The New York Times*, 20 February 2014.

⁷⁹ Crisis Group interview, senior U.S. official, Vienna, 17 February 2014. A European official noted: “The confidential Tehran and Washington channel was a double-edged sword: it helped the process by pre-cooking the deal and harmed it by alienating some P5+1 members”. Crisis Group interview, Vienna, 19 February 2014.

⁸⁰ While that crisis had no tangible impact on the talks, Sergei Ryabkov, Russia's deputy foreign minister, said, “we wouldn't like to use these talks as an element of the game of raising the stakes, taking into account the sentiments in some European capitals, Brussels and Washington. But if they force us into that, we will take retaliatory measures here as well”. Rick Gladstone, “Russia Hints at Using Iran Talks as Leverage”, *The New York Times*, 20 March 2014. A senior Iranian official expressed concern that “Ukraine may diminish the cohesiveness of the P5+1. Some here think that may be a good thing, but I don't believe so. Resolving the [nuclear] issue is important for us, and we need the kind of success that divisions within the P5+1 could compromise”. Crisis Group interview, Tehran, March 2014.

⁸¹ Parisa Hafezi and Fredrik Dahl, “Iran hopes nuclear deal drafting can start by mid-May”, Reuters, 7 April 2014; “Iran, P5+1 experts to meet in New York in May”, Press TV, 17 April 2014.

⁸² JPOA, op. cit. In what seemed a shift from the traditional Israeli focus on static red lines, an Israeli official said, “this is really Rubik's cube, as any one component doesn't mean much in and of itself. One has to produce an overall package of achievements, as one issue affects the others. There are no clear-cut issues, and one has to finally see whether the overall package is something you can live with or not”. Crisis Group interview, Jerusalem, 13 April 2014.

capability.⁸³ The challenge now is to design a limited enrichment program with which all sides can live.

With zero-enrichment ruled out by the JPOA, there are two possible approaches to determining and rationalising restrictions on the program's scale and scope. The first is based on defining "practical needs".⁸⁴ Iran has one U.S.-built research reactor in Tehran (TRR), using 20 per cent enriched uranium, one Russian-built nuclear power plant in Bushehr (BNPP), using 3.5 per cent enriched uranium, and one indigenously designed heavy-water reactor in Arak, still under construction. While Iran has produced enough 20 per cent uranium to fuel the TRR for several years,⁸⁵ Russia is under contract to supply the BNPP's fuel for its first ten years (until 2021-22), and is prepared to continue doing so for the reactor's lifespan.⁸⁶ As a heavy-water plant, Arak operates with natural uranium fuel, but even if reconfigured to function on low-enriched uranium as part of the final agreement, its needs will be limited.⁸⁷ Given that construction of additional nuclear research and power reactors by foreign suppliers or Iranian entities would take more than a decade,⁸⁸ Iran's current nuclear fuel requirements are minimal.

Iranian officials, however, offer a fundamentally different assessment of their country's practical needs. First, based on prior experience, they consider international

⁸³ President Obama said, "if [the West] could create an option in which Iran eliminated every single nut and bolt of their nuclear program, and foreswore the possibility of ever having a nuclear program, and, for that matter, got rid of all its military capabilities, I would take it. But that particular option is not available". See "Obama at Saban Forum", *Haaretz*, 7 December 2013. For more arguments in favour and against zero enrichment, see Michael Singh, "The Case for Zero Enrichment in Iran", *Arms Control Today*, March 2014; George Perkovich, "Demanding Zero Enrichment from Iran Makes Zero Sense", *Foreign Affairs* (online), 15 January 2014.

⁸⁴ Crisis Group interviews, U.S. officials, Geneva, November 2013; Washington, March 2014; Robert Einhorn, "To resolve the Iranian nuclear issue, focus on practical needs", Brookings Institution, 16 February 2014.

⁸⁵ The TRR operated for more than a dozen years on nearly 115kg fuel that Iran purchased from Argentina in 1993. See Claude van England, "Iran Defends Its Pursuit of Nuclear Technology," *Christian Science Monitor*, 18 February 1993. Between 2010-2014, Tehran produced 447.8kg of 20 per cent enriched uranium that was partly converted to fuel for the TRR and partly down blended. See IAEA, GOV/2014/10, annex 2, p. 1, op. cit. This stockpile should be sufficient for fuelling the TRR for more than a decade, but for unclear reasons some Iranian officials have suggested a shorter time frame. See "صالحی: سوخت راکتور تهران تا 5 سال موجود است" [Salehi: The TRR has fuel for five years], *Fararu.ir*, 15 January 2014.

⁸⁶ "Russian Contract Extended to Fuel," *Nuclear News*, vol. 47, 1 October 1995; Mark Hibbs, "Iran's Centrifuges and Bushehr", *Arms Control Wonk*, 14 March 2014. Article 5 of the Iran-Russia agreement states: "Russian organisations shall supply Iran with nuclear fuel for the Bushehr Nuclear Power Plant being built there in accordance with the present Agreement for the reactor's entire lifespan. The fuel shall be supplied in the form of finished sets of fuel assemblies and control rod assemblies". Crisis Group email correspondence, Anton Khlopkov, director, Centre for Energy and Security Studies, Moscow, 24 March 2014.

⁸⁷ If Arak is redesigned to operate on 5 per cent enriched uranium, it will need, depending on its configuration, between 88 and 167kg of fuel every year, which could be produced with 670 to 1,300 IR-1 machines. Draft analysis shared with Crisis Group by Daryl Kimball and Lance Garrison of the Arms Control Association based on calculations of burn-up rates for the Arak reactor as predicted by Thomas Mo Willig, "Feasibility and Benefits of Converting the Iranian Heavy Water Reactor IR-40 to a More Proliferation Resistant Reactor", Norwegian University of Life Sciences, 2011.

⁸⁸ The director of Iran's Atomic Energy Organisation said constructing the 360 megawatt power reactor Iran plans at Darkhovin could "take ten to fifteen years, if all goes well". See "صالحی خبر داد" [Salehi announced: Installation of 1,000 second generation centrifuges], Iranian Students News Agency, 29 December 2013.

suppliers of nuclear fuel, including Russia, unreliable.⁸⁹ Thus, Iran wants to be prepared to take over fuelling the BNPP after the contract with Russia expires or in case of unforeseen problems, an eventuality that would require more than a fivefold increase of the current number of centrifuges.⁹⁰ Moreover, Tehran argues that it must prepare the infrastructure for fuelling, either on its own or in cooperation with foreign firms, several research and power reactors it intends to build.⁹¹ Western officials dismiss these justifications as “hypothetical” and “aspirational”.⁹²

Herein lies the defect of an approach based on practical needs: even those who support the approach have trouble agreeing, because they have different ideas about what constitutes a need. While Iran's current nuclear fuel requirements are practically nil, it has immense pride in its enrichment program and has invested great resources in it at an enormous price.⁹³ For Iran, this in itself constitutes a “need” for enrichment; however, in economic, legal and safety terms, its officials have been unsuccessful at making the case.⁹⁴

⁸⁹ Robert Einhorn, former U.S. State Department special non-proliferation adviser, said, “it bedevils me that the Iranians say in the face of their Russian partners that they cannot trust them to supply the BNPP's fuel. They seem to forget that Russia defied the West by building the Bushehr reactor and insisting on a carve-out from Security Council restrictions to complete and fuel it”. Crisis Group interview, Istanbul, 20 February 2014. An Iranian official retorted: “If you want to know whether Russia employs energy as a weapon or not, just look at Ukraine”. Crisis Group interview, Istanbul, April 2014. In a letter to the IAEA, Iran substantiated its trust deficit in foreign suppliers of nuclear fuel by laying out a list of defaulted contracts with Western companies since the 1979 revolution. INFCIRC/785, IAEA, 2 March 2010. If Iran were denied fuel, it would lose a return on its investment of at least \$200 million per year for each idled reactor. See Frank N. von Hippel, “National fuel stockpiles: an alternative to a proliferation of national enrichment plants?” *Arms Control Today*, September 2008.

⁹⁰ A senior Iranian official noted: “When Iran has the right and capability to produce fuel for the BNPP after Russia completes its obligations, why shouldn't it?” Crisis Group interview, Vienna, April 2014. Refuelling a Bushehr-type VVER reactor, with a nominal power rating of 910 megawatts, operating with a commercial capacity factor and duty cycle, requires about 100,000 separative work units of enrichment capacity per year. Mark Hibbs, “Iran's Centrifuges”, op. cit.

⁹¹ According to 2005 legislation, Iran must develop the fuel cycle infrastructure required to support a 20,000 megawatts nuclear power program “قانون دستیابی به فن آوری هسته‌ای صلح‌آمیز” [“The Law on Acquiring Peaceful Nuclear Technology”], Iran parliament, 15 May 2005, at <http://rc.majlis.ir/fa/law/show/97747>. In February 2014, Iran informed the IAEA it intended to build a ten-megawatt light water research reactor. IAEA, GOV/2014/10, p.4, op. cit. Reportedly, Iran and Russia also are working on a draft agreement to build two more power reactors in Bushehr. “Iran and Russia discuss new nuclear deal”, Al Jazeera, 12 March 2014.

⁹² Crisis Group interviews, European officials, Vienna, February-April 2014; telephone interviews, former U.S. officials, Washington, February 2014.

⁹³ A senior Iranian official asked: “After all our investment in blood and treasure, the West now expects us to rely on them for our fuel needs?” Crisis Group interview, Vienna, April 2014; Scott Peterson, “How much is a nuclear program worth? For Iran, well over \$100 billion”, *Christian Science Monitor*, 3 April 2013.

⁹⁴ It is not clear if Iran would be able to fuel the BNPP on its own. The reactor's fuel designs and composition are protected by Russian intellectual property contracts. Any attempt to copy them would be considered a breach of Iran's service agreement with Russia. Moreover, Iran lacks diagnostic and quality control systems to safely produce fuel for the BNPP. Crisis Group interview, former Iranian official, Istanbul, November 2013. A former U.S. official wrote: “Any power reactor that Iran may wish to construct and fuel indigenously is at least 15 to 20 years away – and even then, it would be cheaper to do what many countries with advanced nuclear programs do: rely on the international market to acquire enriched uranium Foreign suppliers are in the best position to provide enriched uranium that meets the precise specifications of the reactors they design and build”. Robert Einhorn, “Preventing a nuclear-armed Iran: Requirements for a Comprehensive Nuclear

An alternative approach to fixing the scope and scale of the nuclear program is based on “breakout time”⁹⁵ – a function of total uranium enrichment capacity as determined by the number of centrifuges, their efficiency and the amount of accumulated enriched uranium that could be used as feedstock. Most estimates put Iran’s current breakout time using uranium at no more than eight weeks.⁹⁶ Under this approach, the objective would be to establish a breakout window that would leave sufficient time to detect and decisively react to a dash toward nuclear weapons, thus deterring Tehran from the risk.⁹⁷ The P5+1 has communicated to Iran that the breakout time would need to be measured in years, not months, though expert opinions vary.⁹⁸

Lengthening the breakout time could be achieved through various combinations of constraints on centrifuges and enriched uranium stocks.⁹⁹ Both the quantity and quality of the equipment affects breakout time, which decreases as the number and efficiency of machines increase; efficiency is also important for transparency, since a small number of more efficient centrifuges is easier to conceal in a covert facility.¹⁰⁰ Finally, any stockpile of enriched uranium could expedite a sprint toward weapons-grade uranium.

Other enrichment-related restrictions likely would include limiting the number of enrichment facilities to one (ie, keeping the main facility in Natanz and shutting down the bunkered facility in Fordow),¹⁰¹ kerbing related research and development (R&D)

Agreement”, Brookings Institution, March 2014, p. 34. Uranium resources in Iran are scarce. “Uranium: Resources, Production and Demand”, joint report, OECD Nuclear Energy Agency and the IAEA, 2011.

⁹⁵ Breakout time is the time required to produce the so-called “significant quantity” of highly enriched uranium (28kg uranium hexafluoride or 25kg of pure uranium enriched to 90 per cent) required for a nuclear bomb.

⁹⁶ Patrick Migliorini, David Albright, Houston Wood, and Christina Walrond, “Iranian Breakout Estimates”, Institute for Science and International Security (ISIS), 24 October 2013; “Netanyahu: interim deal set Iran’s nuclear drive back by 6 weeks”, Reuters, 28 January 2014.

⁹⁷ Crisis Group interview, French official, Washington, November 2013; British official, Vienna, February 2014.

⁹⁸ Crisis Group interviews, U.S., European and Israeli officials, Vienna, Istanbul, Tel Aviv, January-March 2014; Einhorn, “Preventing a nuclear-armed Iran”, op. cit., pp. 29-30; David Albright, Patrick Migliorini, Christina Walrond, and Houston Wood, “Maintaining at Least a Six-Month Breakout Timeline: Further Reducing Iran’s near-20 percent Stock of LEU”, ISIS, 17 February 2014.

⁹⁹ Once the JPOA is fully implemented, Iran will have around 19,000 first generation IR-1 centrifuges, 1,000 more advanced IR-2 machines, less than ten tons of 3.5 per cent enriched uranium in different forms and 350kg of oxidised 20 per cent enriched uranium. To achieve a six-month breakout window, some U.S. experts have suggested reductions to 4,000 IR-1 centrifuges, about 1,000kg of 3.5 per cent and 100kg of 20 per cent enriched uranium, or 6,000 IR-1s, 1500kg of 3.5 per cent and no 20 per cent material. The numbers would be much lower if the more powerful IR-2 machines were employed. “Defining Iranian Nuclear Programs in a Comprehensive Solution under the Joint Plan of Action”, ISIS, 15 January 2014; “Maintaining at Least a Six-Month Breakout Timeline”, ISIS, op. cit; Einhorn, “Preventing a nuclear-armed Iran”, op. cit. Others have proposed even lower numbers: Dennis Ross, “How to Solve Obama’s Iran Dilemma”, *Politico*, 26 January 2014.

¹⁰⁰ Centrifuge output is measured in Separative Work Units (SWU) per year. While Iran’s first generation IR-1 machines have an average SWU/year of 0.76, the more sophisticated iterations are estimated to be three to five times more powerful. IR-1 centrifuges, based on a 1970s Dutch design, are inefficient and prone to mechanical failures. Simon Henderson and Olli Heinonen, “Nuclear Iran: A Glossary of Terms”, Washington Institute of Near East Policy, May 2013.

¹⁰¹ Crisis Group interviews, European officials, Geneva, Vienna, November 2013-February 2014. Iran has installed nearly 3,000 IR-1 centrifuges in Fordow. President Obama said, “we know that they don’t need to have an underground, fortified facility like Fordow in order to have a peaceful nuclear program”. “Obama at Saban Forum”, op. cit.

activities¹⁰² and constraining the number of centrifuge production facilities.¹⁰³ From Iran's perspective, these would constitute severe restrictions that are seen as unjustifiable as unjust. It rejects the breakout capacity approach on principle: since it is willing to ensure complete transparency, it says, there is no reason to design its nuclear program on the unfounded assumption that it plans a sprint to weaponisation.

Tehran is loath to negotiate enrichment capacity, maintaining that it needs not only to be preserved but increased.¹⁰⁴ Having publicly ruled out dismantling centrifuges, shutting down facilities and limiting R&D, the political cost of doing so would be considerable.¹⁰⁵ Nor does Iran see any logical reason to limit or shut its enrichment facilities, including Fordow; its ostensible imperviousness to an Israeli strike only increases its value.¹⁰⁶

Beyond the parties' lack of agreement about the utility of breakout limitations, meaningfully measuring it is all but impossible. First, most calculations are rough and purely theoretical estimates. They omit inevitable technical hitches, an unpredictable and time-consuming weaponisation process and anything-but-mechanical political decision-making.¹⁰⁷ The resulting imprecision pushes all parties to adopt

¹⁰² This concern is rooted in the Europeans' prior experience in negotiations that they believe Iran exploited to complete its nuclear infrastructure and hedge closer to nuclear weapons capabilities. Crisis Group interviews, European officials, Vienna, February 2014. Rouhani's own statements have deepened these suspicions. In 2005, he wrote: "While we were talking with the Europeans in Tehran ... by creating a calm environment, we were able to complete the work in Isfahan [nuclear facility]". Hassan Rouhani, "گفتنمان: فراسوی چالشهای ایران و آژانس در پرونده هسته ای", *Rahbord*, 30 September 2005.

¹⁰³ Crisis Group interviews, European officials, Vienna, February 2014.

¹⁰⁴ Crisis Group interview, senior Iranian official, Geneva, 22 November 2013; Vienna, 7 April 2014. The director of Iran's Atomic Energy Organisation announced that "Iran would need fuel for 5,000 megawatts of nuclear power. But it will take us seven to eight years to complete installing 50,000 centrifuges at Natanz, which would be sufficient for just one 1,000 megawatt reactor". See "Salehi: Installation of 1,000 second generation centrifuges", *op. cit.*

¹⁰⁵ In response to a question about Iran's preparedness to dismantle some existing centrifuges, President Rouhani said, "not under any circumstances". "Iranian President Rouhani on Iran's Nuclear Technology", Fareed Zakaria GPS, CNN, 26 January 2014. The Supreme Leader announced the following red lines for the nuclear negotiations: scientific progress should not be halted or slowed; R&D should continue; nuclear achievements should not be bargained away; bullying should be resisted; and relations with the IAEA should be normalised. See "Khamenei's Red Lines on Nuclear Talks", Iran Primer, United States Institute of Peace, 16 April 2014.

¹⁰⁶ Crisis Group interview, former Iranian official, Istanbul, November 2013. An Israeli official reacted: "There are two arguments for shutting down Fordow: first, if Iran wants to be treated like any other NPT member state, why does it need to have a civilian nuclear program in a military site? Secondly, Fordow was born in sin, a violation of international law. Why legitimise it? In addition, if you look at the worst case scenario, in which Iran decides to violate the agreement, expel inspectors, turn off the cameras and dash forward, Fordow is where it could do it". Crisis Group interview, Jerusalem, 13 April 2014.

¹⁰⁷ These estimates exclude the time required to chemically convert natural uranium to uranium hexafluoride feed, reconfigure cascades to enrich uranium to weapons grade and convert the product to uranium metal. They also assume an ideal cascade with full recycling of tails, that the weapons design work has already been done, and Iran will risk breaking out with just one bomb worth of weapons grade uranium. Crisis Group email correspondence, Steve Fetter, University of Maryland professor, 3 February 2014. A senior Iranian official said, "serious people know that even if Iran sought nuclear weapons, it will take years to manufacture one. What is more, no state has ever invited international opprobrium or a military strike just to produce a few kilograms of highly enriched uranium". Crisis Group interview, Vienna, April 2014.

worst-case scenarios, rendering breakout estimates unrealistic as a basis for a durable agreement and policy.

Secondly, breakout scenarios reduce a complex process to a one-dimensional race against time. This ignores competing interests and risk avoidance – most importantly, the risk of being caught. In any conceivable final agreement, rigorous monitoring mechanisms would increase significantly the chance of immediately detecting a breakout effort. Some counter that the evidence of a putative breakout is likely to be ambiguous and require further investigation; particularly given the West's current preference for diplomacy, critics hold, it may be too late for forceful action by the time it could be mobilised.¹⁰⁸ This may well be true, though any breakout effort that could bring Iran close to a nuclear weapon, under the watchful eyes of IAEA monitors, would have to be quite brazen and would be the kind of infringement likely to expedite and to a certain extent legitimise a firm response.¹⁰⁹

Defining a tolerable breakout limit is less a technical exercise than a political judgment. At worst, it is arbitrary. More importantly, it neglects that in the case of Iran, a "sneak-out" at a clandestine enrichment facility would be more likely than a breakout in a declared facility.¹¹⁰

2. Arak Reactor

Concerns over the heavy-water reactor in Arak, ostensibly aimed at producing isotopes for medical treatments, centre on its potential to produce significant quantities of plutonium in its spent fuel, providing a second path to a nuclear bomb.¹¹¹ First revealed in 2002, the reactor is 87 per cent constructed.¹¹² The P5+1 seeks to replace

¹⁰⁸ Crisis Group interviews, former U.S. officials, Istanbul, Washington, February-March 2014.

¹⁰⁹ U.S. Secretary of State Kerry, noted: "If they're overtly breaking out and breaking an agreement and starting to enrich and pursue it, they've made a huge consequential decision. And the greater likelihood is we are going to respond immediately". See Patricia Zengerle, "Kerry says Iran nuclear 'breakout' window now seen as two months", Reuters, 8 April 2014. A former U.S. defence official noted: "With nearly 40,000 troops in the region, operationally, it takes less than 48 hours for the U.S. to react to an Iranian nuclear breakout effort". Crisis Group telephone interview, Washington, February 2014.

¹¹⁰ Crisis Group interview, Gary Samore, former White House arms control coordinator, Boston, 28 February 2014. Iran's main enrichment facilities in Arak and Fordow, initially undeclared, were exposed by Western intelligence agencies. The U.S. intelligence community also considers sneak-out as a greater risk. See "Iran Nuclear Intentions and Capabilities", National Intelligence Council, November 2007, p. 8. So do Israeli officials. Crisis Group interview, former senior Netanyahu adviser, 21 November 2013.

¹¹¹ The reactor, operating on natural uranium fuel, could produce 4.3 tonnes of spent fuel annually containing about 9kg of weapons-usable plutonium, sufficient for one nuclear bomb. That its design resembles the reactors used in the nuclear weapons programs of the U.S., Israel, India, Pakistan and Taiwan deepens suspicions. Crisis Group email correspondence, Frank von Hippel, Princeton University professor of international affairs, 2 February 2014. Iran justifies its quest for such a reactor in its history of deprivation from advanced nuclear technologies by the West. An official said, "the reason Iran opted for a heavy water reactor was two-fold: it was easier to construct than other models, and it did not require enriched uranium. Faced with technology denial, we had to hedge our bets". Crisis Group interview, Prague, February 2014.

¹¹² "Construction of Arak plant makes 87% progress: AEOI", Press TV, 11 March 2014.

it with a light-water research reactor fuelled with enriched uranium that produces less plutonium, so is less conducive to proliferation.¹¹³

Iran maintains that “its scientists have endeavoured for more than a decade to overcome technological challenges for building the Arak reactor” and that “converting it into a light-water reactor is tantamount to starting from scratch”.¹¹⁴ Tehran has suggested a less extensive redesign that would make the reactor less conducive to proliferation and has agreed to ship out its spent fuel.¹¹⁵ Since plutonium can be extracted from the spent fuel only by a chemical process, it also has considered pledging not to construct the necessary reprocessing facilities.¹¹⁶ The P5+1 and Israel remain concerned that Iran could suddenly revert to the original design and build a reprocessing facility. That would be a lengthy but hard to stop process, given the environmental risks of striking an operational reactor.¹¹⁷

3. Transparency and Verification

In parallel to erecting a firewall between Iran's military and civilian nuclear capabilities – by kerbing its uranium enrichment and plutonium production – the P5+1 is also demanding additional transparency and verification measures to ensure that nuclear activities remain civilian and that there is sufficient time to detect noncompliance. The group holds that given Iran's track record – failure to announce some past activities to the IAEA and fairly compelling evidence that until 2003 it had an organised program to acquire nuclear weapons capabilities – there is a need for transparency measures beyond existing NPT obligations.¹¹⁸

¹¹³ Crisis Group interviews, U.S. and UK officials, Geneva, November 2013. President Obama said, “[The Iranians] certainly don't need a heavy-water reactor at Arak in order to have a peaceful nuclear program”. “Obama at Saban Forum”, op. cit.

¹¹⁴ Crisis Group interview, Istanbul, November 2013; also see “Iran will never abandon Arak heavy water reactor”, Agence France-Presse, 1 December 2013.

¹¹⁵ See “Arak heavy water reactor is for peaceful research”, Press TV, 5 February 2014. Such conversion is not without precedent. In 1991, a similar reactor in Algeria was converted to use 3 per cent low-enriched instead of natural uranium, which reduced the amount of plutonium it produced nearly tenfold. William Burr, “The Algerian Nuclear Problem, 1991: Controversy over the Es Salam Nuclear Reactor”, National Security Archive, Electronic Briefing Book no. 228, document 18, 10 September 2007. For similar proposals, see Saman Tashakor, Farshid Javidkia and Mehdi Hashemi-Tilchnoee, “Neutronic Analysis of Generic Heavy Water Research Reactor Core Parameters to Use Standard Hydride Fuel”, *World Journal of Nuclear Science and Technology*, vol. 1, 2011, pp. 46-49; Thomas Mo Williga, Cecilia Futsaetherb and Halvor Kippea, “Converting the Iranian Heavy Water Reactor IR-40 to a More Proliferation-Resistant Reactor”, *Science & Global Security*, vol. 20, no. 2-3, 2012; Anton Khlopkov, “The Arak Research Reactor: How to make it proliferation-resistant”, Center for Energy and Security Studies, 15 December 2013; Ali Ahmad, Frank von Hippel, Alexander Glaser, and Zia Mian, “A solution for Iran's Arak reactor”, *Arms Control Today*, April 2014.

¹¹⁶ Crisis Group interviews, Iranian officials, Istanbul, February 2014.

¹¹⁷ Crisis Group interviews, U.S. and European officials, Washington, Vienna, February 2014; Israeli official, Jerusalem, 13 April 2014. Twice before and out of fear of creating widespread radioactive contamination, Israel has attacked suspected reactors in regional countries before their completion: Iraq in 1981 and Syria in 2007. “Iran's Arak reactor looms into Israeli, Western view”, Reuters, 2 June 2013.

¹¹⁸ Iran's Comprehensive Safeguards Agreement allows the IAEA to account for nuclear material in declared enrichment, fuel fabrication, reactors, spent fuel storage, reprocessing and the output of a uranium-conversion facilities but does not include mining, milling, waste disposal and the input to a conversion facility.

These come in several forms. Ratification and implementation of the IAEA's Additional Protocol (AP) certainly would give its inspectors greater access to facilities and information.¹¹⁹ More broadly, the P5+1 maintains that the Iranian case will require unique arrangements to enable the IAEA to determine – called drawing “broader conclusions” in the agency's jargon¹²⁰ – the “correctness” (ie, non-diversion of nuclear material from declared activities) and completeness (ie, absence of undeclared nuclear activities) of Iran's declarations to the agency.¹²¹ P5+1 members also contend that Iran's evasive behaviour warrants extra measures, like maintaining UN restrictions on uranium and dual-use equipment, accounting for the sources and destination of these materials and eventually establishing export and import control regulations that conform to international norms for such materials.¹²²

In principle, Iran appears much more willing to accept additional transparency measures than to restrict the evolution of its nuclear program.¹²³ Still, some in Tehran view intrusive inspections as a ploy to obtain information about its military capabilities.¹²⁴ Iran insists, therefore, that monitoring and verification measures beyond the AP be carried out within a mutually agreed framework and for a temporary period only.¹²⁵ Finally, Iranian officials contend that the parliament (*majlis*) – whose con-

¹¹⁹ The IAEA's Model Additional Protocol (INFCIRC/540) expands its access to all parts of a state's nuclear fuel cycle, including uranium mines, fuel fabrication and enrichment plants, and nuclear waste sites; and provides greater access rights. But the inspectors cannot barge into any facility at will. Under the managed-access provision, they can request access within two hours to a facility at a site they are presently inspecting and within 24 hours to a new site. If needed, the agency can deploy environmental sampling and remote monitoring techniques.

¹²⁰ Both paragraph 2 of INFCIRC/153 (Corr.) and Article 2 of Iran's Safeguards Agreement require the IAEA to seek to verify both the non-diversion of nuclear material from declared activities and the absence of undeclared nuclear activities in Iran.

¹²¹ Crisis Group interviews, Vienna, Boston, February 2014. The AP neither grants access rights to individuals and original documents that might be needed for investigations, nor determines deadlines for states to respond to IAEA requests for information or clarification. For more on limitations of the AP, see P. Goldschmidt, “IAEA Safeguards: Dealing preventively with non-compliance”, Carnegie Endowment for International Peace, 12 July 2008.

¹²² Crisis Group telephone interviews, former U.S. official, Washington, February 2014; European official, Vienna, 19 February 2014.

¹²³ Iran's activities are already under strict UN monitoring. Tariq Rauf, former head of the IAEA verification and security policy coordination office, said, “it is easy to forget that Iran is the most inspected country in the world and gives the kind of access to the agency (for example to its centrifuge cascades) that no other country provides”. Crisis Group interview, Istanbul, 4 November 2013. But Colin Kahl, an ex-Obama administration official, cautioned: “Iran will not be able to trade transparency for capability. Limits on the depth and breadth of the nuclear program should go hand in hand with rigorous monitoring”. Crisis Group telephone interview, Washington, 14 February 2014. An Israeli defence official concurred. “Iran wants to keep its nuclear capabilities in exchange for going far on the extent to which monitoring is intrusive. But that is not worth much. Inspectors can be expelled or prevented from visiting a site based on a made-up pretext. What are our options if that happens?” Crisis Group interview, Tel Aviv, 2 January 2014.

¹²⁴ “Disruptive visits to our military installations exacerbate the paranoia of those in Iran who believe that the West is seeking to subvert the regime, just as it happened in Iraq after Saddam was defeated in the first Gulf War. It is also a question of dignity”. Crisis Group interview, former Iranian official, January 2014.

¹²⁵ Crisis Group interviews, Iranian officials, Istanbul, February 2014. A former senior IAEA official explained that the reason Iran refuses to install remote-stream cameras in its centrifuge facilities is that “previous sabotage and other covert actions have made them wary of any electronic transmission to the outside world”. Crisis Group telephone interview, January 2014.

sent is constitutionally required for ratifying treaties – will not endorse the AP as long as sanctions remain on the books.¹²⁶

4. Possible Military Dimensions (PMD)

The long-term political sustainability of any nuclear agreement hinges on the IAEA's affirmation that Iran's nuclear activities are geared exclusively toward civilian purposes.¹²⁷ In theory, this requires the agency to obtain satisfactory answers to allegations that, at least until 2003, Iran actively worked to develop a military nuclear capability.¹²⁸

Given the P5+1's conviction that the evidence of past violations is compelling, it has put the burden of proof on Tehran, demanded that it take corrective measures and has demonstrated its willingness to use sanctions to force it to resolve the issue fully.¹²⁹ Iran steadfastly denies that it ever pursued nuclear weapons, insists on its religious opposition to them and characterises the agency's evidence as "baseless fabrications".¹³⁰

In February 2014, and after a six-year hiatus, Iran restarted cooperation with the IAEA on one of twelve PMD-related issues.¹³¹ In another constructive gesture, it

¹²⁶ This appears to be both a liability and an asset. It simultaneously provides the Iranian negotiators with a card they can hold up to the U.S. Congress, whose acquiescence is required to lift sanctions; but gives leverage to the Iranian parliament to impose conditions on an acceptable final agreement. Crisis Group interviews, Iranian officials, Istanbul, February-April 2014. Iranian lawmakers were swift to remind the government it lacks authority to make promises on ratifying the AP. See "MPs: The decision about the AP is a prerogative of the parliament", BBC Persian, 18 October 2013. 2005 legislation, in which the parliament, in retaliation for the Security Council resolutions, forbade the government to voluntarily cooperate with the IAEA beyond its legal obligations, has also been referred to in internal debates. See "The law of obliging the government to suspend voluntary cooperation with the IAEA in case of the referral of the nuclear dossier to the Security Council", Iranian Parliament, 22 November 2005.

¹²⁷ The IAEA has repeatedly announced that "while [it] continues to verify the non-diversion of declared nuclear material ..., the Agency is not in a position to provide credible assurance about the absence of undeclared nuclear material and activities in Iran, and therefore to conclude that all nuclear material in Iran is in peaceful activities". See GOV/2014/10, IAEA, op. cit.

¹²⁸ In November 2011, the IAEA issued a report detailing in a fourteen-page annex charges that Tehran experimented with technologies related to development of nuclear weapons in a structured program that was – for the most part – disbanded in 2003. "Implementation of the NPT Safeguards Agreement and relevant provisions of Security Council resolutions in the Islamic Republic of Iran", IAEA, GOV/2011/65, 8 November 2011. Reportedly, the agency has obtained updated information about Iran's PMD file but chosen not to publish it. See "U.N. nuclear agency opted against sensitive Iran report", Reuters, 27 February 2014.

¹²⁹ Crisis Group interviews, European officials, Vienna, April 2014. A former U.S. official said, "confession is good for the soul, but not for confidence building. Iran needs to accept long-term constraints on its program to restore the world's trust". Crisis Group telephone interview, Washington, February 2014. An Iranian official asked: "Shouldn't the burden of proof be on U.S. intelligence organisations, with their miserable track record, who have brought up these unsubstantiated claims?" Crisis Group interview, Istanbul, April 2014.

¹³⁰ Crisis Group interview, Ali Asghar Soltanieh, former Iranian IAEA ambassador, Vienna, 16 May 2012; "Rouhani says Iran will not acquire nuclear weapons 'on principle'", *The Guardian*, 1 March 2014.

¹³¹ Iran and the IAEA agreed to address questions on experiments related to exploding bridgewire detonators that could possibly be used in nuclear explosives. See Kelsey Davenport, "Iran, IAEA Begin Cooperation on Possible Military Dimensions", *Arms Control Now*, 9 February 2014. A French official said, "tackling one issue is not real progress". But an IAEA official noted that "it could be a good litmus test". Crisis Group interviews, Vienna, April 2014.

stated that, for the first time, it is compiling a comprehensive account of its nuclear activities.¹³² Tehran, however, has made a comprehensive PMD investigation conditional on three demands: agreement with the IAEA on limiting the scope, as well as the length, of the investigation in accordance with Iranian security concerns;¹³³ political reassurance that the P5+1 will not use the PMD issue for pressuring Iran;¹³⁴ and adequate compensation for Iran's shedding light on these allegations in the form of sanctions relief and flexibility on other fronts.¹³⁵

5. UN Security Council Resolutions (UNSCRs)

Six UNSCRs, in precisely the same language, have required Iran to suspend "all enrichment-related and reprocessing activities, including research and development", until the IAEA determines that it has fully complied with its obligations, and confidence in the exclusively peaceful nature of the nuclear program is restored.¹³⁶ The last resolution (1929) also called for Iran to halt development of ballistic missiles capable of carrying nuclear weapons and ratify the Comprehensive Nuclear-Test-Ban Treaty (CTBT).¹³⁷ While both sides seem to believe that enshrining a putative comprehensive agreement in a new resolution would supersede previous ones, they disagree about the timing and sequencing of lifting the UN-mandated sanctions.¹³⁸

¹³² An official at Iran's Atomic Energy Organisation said, "there are various files on our atomic program, but we're lacking a comprehensive document, which we are writing now. This is time-consuming, as we need to coordinate with other government bodies, but we hope to have it finished in eight months". Quoted in Mehrdad Balali, "Iran admits nuclear agency reshuffle to pave way for 5+1 talks", Reuters, 21 April 2014.

¹³³ According to an IAEA official, due to security concerns, Iran refuses to allow access to inspectors who are nationals of certain countries. But given that nuclear weapons know-how is a specialised expertise, only in the hands of a few states, the agency's options are limited. Also, Iran is loath to permit inspections beyond nuclear material accountancy; but the agency will not be able to fully investigate nuclear weapons-related activities with such a narrow scope. Crisis Group interview, Vienna, April 2014. For more debate on the scope of the IAEA's mandate, see Dan Joyner, "The IAEA Applies Incorrect Standards, Exceeding its Legal Mandate and Acting Ultra Vires Regarding Iran", *armscontrolaw.com*, 13 September 2012; Paul Kerr, "Iran's Nuclear Program: Tehran's Compliance with International Obligations", Congressional Research Service, 28 April 2014.

¹³⁴ A senior Iranian official said, "if past is prologue, our ability to resolve the PMD issue is a function of our relations with the West and could only be addressed in a calm environment". He added: "It is also a question of time and trust. The West maintains that removing the sanctions will hinge on restoration of trust. Well, Iran's military will also need more trust before it could allow inspectors to wander around its facilities". Crisis Group interview, Vienna, April 2014.

¹³⁵ A former Iranian official explained: "So far the pattern has been that the IAEA acts on politically-motivated intelligence provided to it by countries hostile to Iran [and] creates a media frenzy around it by leaking the information to the press. This is very counterproductive". Another former official added: "Resolving the PMD issues will require Iran to allow inspections beyond its current obligations. The agency is in no position to reward Iran for such cooperation, thus making it important for the P5+1 to provide the necessary reassurances and inducement". Crisis Group interviews, Istanbul, November 2013.

¹³⁶ See Resolutions 1696, 31 July 2006; 1737, 27 December 2006; 1747, 24 March 2007; 1803, 3 March 2008; 1835, 27 September 2008; and 1929, 9 June 2010.

¹³⁷ "The Security Council decides that Iran shall not undertake any activity related to ballistic missiles capable of delivering nuclear weapons, including launches using ballistic missile technology ... Calls for the ratification of the Comprehensive Nuclear-Test-Ban Treaty by Iran at an early date". UNSCR 1929.

¹³⁸ Crisis Group interviews, U.S., EU, Iranian officials, Vienna, April 2014. A former U.S. official said, "the Security Council is the master of its own fate, and its permanent members are at the table with

The main sticking point, however, is Iran's development of ballistic missiles. Western officials argue that as delivery systems are an integral part of a nuclear weapons program, they have to be addressed to satisfy UNSCR requirements, particularly through constraints on missile range.¹³⁹ Iranian nuclear officials have announced that they consider their country's missile program a matter of national defence, and as such, it is neither negotiable nor subject to compromise.¹⁴⁰ The Iranian negotiators' authority regarding this issue is unclear.¹⁴¹ So too is the definition of "nuclear-capable missiles", the development of which could prompt the P5+1 to insist on restrictions on Iran's missile program.¹⁴²

6. Sanctions Relief

The JPOA specifies that all "nuclear-related" sanctions are to be lifted as part of a putative comprehensive accord.¹⁴³ In practice, that will be anything but simple. While defining a nuclear-related UN and EU sanction is relatively straightforward, the same cannot be said of U.S. sanctions, as most are tied not only to non-proliferation concerns but also to Iran's foreign or domestic policies.¹⁴⁴ The standard for lifting U.S.

Iran". Crisis Group telephone interview, Washington, February 2014. An Iranian official agreed and added: "The resolutions passed at a time that both sides sought maximalist demands. Times have changed, and the resolutions have to change too". Crisis Group interview, Tehran, March 2014.

¹³⁹ Crisis Group interviews, U.S. and European officials, Vienna, February 2014. The IAEA suspects that Iran has conducted research on integrating a nuclear weapon into the payload chamber of its Shahab-3 missile's re-entry vehicle. See IAEA, GOV/2011/65, op. cit. A French official said, "the longer a missile travels, the less conventional utility it has. Thus the best approach is to limit the range of Iran's missiles, even if temporarily". Crisis Group interview, April 2014.

¹⁴⁰ Pointing out that it was a mistake to conflate the missile and nuclear programs in the resolution, an Iranian official asked: "How can the West ask Iran to abandon or limit its missile program, when it is arming our neighbours to the teeth and supporting Israel who is constantly threatening to attack Iran". Crisis Group interview, Tehran, March 2014; in the words of Michael Elleman, an expert at the International Institute for Security Studies, "[The missiles] represent one of Iran's few capabilities to deter attack, intimidate regional rivals, and boost military morale and national pride". Quoted in Fredrik Dahl, "Iran's ballistic missiles may become hurdle in nuclear talks", Reuters, 8 April 2014; Ali Akbar Dareini, "Official: Iran will not discuss missile program", Associated Press, 16 April 2014.

¹⁴¹ Iran's defence matters are directly under the Supreme Leader's control. An ex-Iranian official offered a telling example: "Recently, Rouhani tried to prevent a missile test that he believed would create unwarranted focus on Iran's missile program; but at the end, he did not carry the day and the test was conducted". Crisis Group interview, Istanbul, February 2014; Karl Vick, "Iran's Rouhani Blocks Missile Test, Fights Hardliners", *Time Magazine*, 10 February 2014.

¹⁴² "The closest thing to a standard 'nuclear capable' definition is the minimum payload to range criteria in the Missile Technology Control Regime, which is a missile capable of carrying a 500kg payload 300km. Yet Iran cannot be expected to dismantle its medium-range missiles, absent similar constraints on other similarly-armed countries in the region, which are hostile to it". Crisis Group email correspondence, Greg Thielmann, Arms Control Association, Washington, 11 March 2014. Iran has a wide range of short- and medium-range ballistic missiles, but contrary to some claims, there is no evidence it is developing intercontinental ballistic missiles. Michael Elleman, "Iranian ICBMs: a distant prospect", International Institute for Strategic Studies, 13 November 2013.

¹⁴³ The final step would "comprehensively lift UN Security Council, multilateral and national nuclear-related sanctions, including steps on access in areas of trade, technology, finance, and energy, on a schedule to be agreed upon". JPOA, op. cit.

¹⁴⁴ See Crisis Group Report, *Spider Web*, op. cit. For example, among the most important sanctions Iran expects on the table are those that target investment in oil and gas infrastructure, from the Iran Sanction Act. It is unclear if these are nuclear-related; they pre-date the nuclear crisis but were

sanctions is high; the president can nullify an executive order, but the majority of restrictions have been codified by Congress. When permitted by law, exercising waiver authority or ordering greater flexibility in enforcing the penalties is another option available to the president. Iran, however, rejects the waiver approach, as it leaves Tehran vulnerable to congressional activism or changing political winds in Washington. A senior Iranian official said, “both sides have to accept similar risk. Merely waiving sanctions does not inspire the confidence necessary for making monumental nuclear concessions”.¹⁴⁵

While U.S. negotiators have reassured their Iranian counterparts that the Obama administration will be able to deliver sanctions relief,¹⁴⁶ they seem to have a fairly narrow view of how to accomplish that, at least initially: waiver authority.¹⁴⁷ Some in Congress have expressed alarm that the White House could bypass the legislative branch in relaxing sanctions;¹⁴⁸ accordingly, they argue that any agreement with Iran should be a treaty and thus require Senate consent.¹⁴⁹ Other members see the matter differently. Worried the legislature could stipulate unattainable criteria for an acceptable deal, they are pressing their colleagues to avoid further complicating an already fraught process.¹⁵⁰

Another challenge lies in the sequencing of Iranian concessions and P5+1 sanctions relief, especially since multilateral sanctions require international support to enforce and therefore are harder to reimpose. Robert Menendez, chairman of the U.S. Senate Foreign Relations Committee, asserted:

partly motivated by non-proliferation concerns. Crisis Group interview, Iranian officials, Tehran, March 2014; ex-U.S. officials, Washington, March 2014.

¹⁴⁵ Crisis Group interview, Vienna, 19 February 2014. Iran took its demand for irreversible relief a step further, demanding reassurances that once lifted, sanctions would not be re-imposed on another pretext. Crisis Group interview, senior Iranian official, Vienna, 19 February 2014.

¹⁴⁶ Crisis Group interview, senior Iranian official, Tehran, March 2014. Remaining mistrustful, Iran's Supreme Leader equated waiting for “the enemy” to lift sanctions with being on “a road to hell” and stressed becoming more self-reliant by developing an “economy of resistance”. See “Iran leader: Improved economy can fight sanctions”, Associate Press, 21 March 2014.

¹⁴⁷ A U.S. official noted: “The JPOA states that all sanctions will be lifted by the end of the comprehensive agreement, so there is nothing that disallows using waivers initially”. Crisis Group interview, Vienna, April 2014.

¹⁴⁸ A Congressional aide equated lifting sanctions “by fiat” with an “outrageous power grab”. Tim Starks, “GOP May Not Get New Iran Sanctions, But Push Won't Disappear”, *Congressional Quarterly*, 28 February 2014. A senator reminded the president: “While the statutes do contain national security waivers that allow for a temporary suspension of these sanctions, the presence of these exacting termination criteria make clear that the intent of Congress was not simply to allow the President to waive all the sanctions in perpetuity at his behest”. “Sen. Paul Issues Letter to President Obama Regarding Iran Negotiations”, U.S. Senate, 6 February 2014.

¹⁴⁹ David Rivkin and Lee Casey, “Congress Can Play a Vital Role in the Iran Talks”, *The Wall Street Journal*, 5 March 2014. Two letters from 83 and 23 senators and a third from 394 House members) to the White House reiterated a demand to play a continuing role in the talks. “Senators urge Obama to push for strict Iran nuclear curbs deal”, Reuters, 22 March 2014.

¹⁵⁰ A House of Representatives member said, “those who want this agreement to become a treaty, in reality want it to fail”. Crisis Group telephone interview, Washington, 11 March 2014. Former Under Secretary of State Nicholas Burns said, “we can only have one president negotiating with Iran, not 525 presidents [members of Congress] negotiating”. Quoted in Mark Landler, “A Bill Stokes Debate, and Doubt, on Iran Deal”, *The New York Times*, 16 January 2014.

If all we achieve is the essence of an early-warning system in Iran's future breakout ability, and the sanctions regime has collapsed, and the only options for this or any future President is to accept a nuclear-armed Iran or a military option, in my view, that is not in the national security interests of the U.S.¹⁵¹

The P5+1 seeks to preserve its leverage by maintaining as much of the sanctions architecture as possible throughout implementation of the comprehensive deal, lest Iran renege on its commitments.¹⁵² Some Western officials also believe that rapid revocation of the sanctions regime would award Iran an undue victory, given its support for violent groups and activities antithetical to their interests.¹⁵³ In contrast, Iranians demand tangible and robust relief early in the process, in order to validate their approach and justify concessions their country will arguably see as painful.¹⁵⁴

7. Sunset Period

Per the JPOA, "following successful implementation of the final step of the comprehensive solution for its full duration, the Iranian nuclear programme will be treated in the same manner as that of any non-nuclear weapon state party to the NPT".¹⁵⁵ Determining precisely when the final step concludes, and even defining it exactly, likely will be contentious, as with much else in this negotiation more a political than a technical exercise. An advance determination of the time required to build sufficient trust in the peaceful nature of the nuclear program will be highly subjective.

The indeterminate nature of the final step offers the P5+1 a justification for stretching out the duration – to a minimum, officials of its member states say, of twenty years.¹⁵⁶ With those in Brussels and Washington, as well Saudi Arabia and Israel, deeply mistrustful of Tehran, even considering normalisation of its nuclear program in the foreseeable future is a non-starter. A former Saudi official insisted that Iran be left "with not a latent capability, but no capability to make nuclear weapons once the world's attention has turned away from Iran".¹⁵⁷

¹⁵¹ See his opening remarks at the committee's hearing on the nuclear talks, 4 February 2014. Pointing to the P5+1's approach as a *fait-accompli*, Germany's chancellor, Angela Merkel, said, "we have decided to take this path, that enrichment is only taking place at a low level, but enrichment is taking place". Tia Goldenberg, "Israel, Germany disagree over Iran nuclear talks", Associated Press, 25 February 2014.

¹⁵² Crisis Group telephone interviews, former U.S. officials, Washington, January-February 2014. A former U.S. official said, "sanctions relief will be akin to a slow releasing pill". Crisis Group telephone interview, Istanbul, February 2014.

¹⁵³ Crisis Group interviews, U.S. officials, August-December 2013. A U.S. senator asserted that frozen Iranian assets released under the JPOA were sufficient to fund Lebanese Hizbollah, which the U.S. considers a terrorist organisation, for 50 years. "Kirk to Kerry: Stop Subsidizing Iran-Sponsored Terrorism", press release, Office of Senator Mark Kirk, 13 March 2014.

¹⁵⁴ Crisis Group interviews, Hossein Mousavian, former Iranian nuclear negotiator, Istanbul, 21 February 2014; Iranian officials, Tehran, March 2014.

¹⁵⁵ JPOA, op. cit.

¹⁵⁶ Crisis Group interviews, European officials, Vienna, February 2014; former U.S. officials, Washington, March 2014, Einhorn, "Preventing a nuclear-armed Iran", op. cit. Some have attempted to justify such duration by pointing to the similar length of Iran's concealment of nuclear activities. Albright, "Defining Iranian Nuclear Programs", op. cit.

¹⁵⁷ Crisis Group interviews, Istanbul, Prague, February 2014. In mirror image, an Israeli defence official expressed similar concerns about the prospects of an unrestrained Iranian nuclear program, even in a distant future. Crisis Group interview, Tel Aviv, 2 January 2014. Prime Minister Netanyahu formulated the criteria for an acceptable deal as "zero enrichment, zero centrifuges, zero plutoni-

For Iran, desirous of the much shorter time frame of three to five years, these arguments give credence to suspicions that the West seeks to deprive it of nuclear technology by imposing unwarranted, long-term limits on its program.¹⁵⁸ As Tehran sees it, once the IAEA concludes that its nuclear program is purely peaceful – a verification process with which the IAEA has considerable experience and that usually takes less than a decade – there should be no reason for it to continue to be treated differently than other NPT member states.¹⁵⁹

um”. See Anne Gearan, “Iran likely to dominate discussions as pro-Israel lobby gathers at Washington conference”, *The Washington Post*, 28 February 2014.

¹⁵⁸ Crisis Group interviews, Iranian officials, Istanbul, Tehran, February-March 2014.

¹⁵⁹ Crisis Group interview, senior Iranian official, Geneva, 22 November 2013. A European diplomat who follows the nuclear talks closely agreed: “The NPT is already founded on double-standards. Let us not degrade it to triple-standards by ostracising Iran. What is more, other member states are reluctant to pick up the tab for these enhanced inspections for more than they are truly needed”. Crisis Group interview, Prague, February 2014.

IV. Bridging the Unbridgeable

The inherent complexity of the nuclear process, the range of political interests affected by the crisis, the depth of mistrust between the parties, their widely divergent views and the time pressures imposed by domestic and regional stakeholders have made reaching a comprehensive agreement a formidable task. Cognisant of this, both sides have tried to temper expectations. President Obama put the odds of a comprehensive agreement at 50-50,¹⁶⁰ a probability Iranians deemed optimistic.¹⁶¹

In the absence of a broader bargain on the regional standoff between Iran, its neighbours and the West, any resolution of the nuclear issue will be at best fragile. Tensions resulting from Tehran's support for Hizbollah and opposition groups, including militants, around the region and beyond; its deep involvement on behalf of the regime in Syria; and its human rights record will continue regardless of a nuclear accord. That said, broader progress is all but impossible until the nuclear issue has been put to rest. It has swelled to such diplomatic and strategic proportions that it virtually rules out political engagement on any other issue. Compartmentalising and resolving it though a technical approach could provide positive momentum on these other matters. And even if the parties are not able to parlay that momentum into a broader agreement, a nuclear deal that meets their interests would make the region, and the world, a safer place.

Ideally for the P5+1 and Iran's regional rivals, a comprehensive accord would put an end to all uranium enrichment and other proliferation-prone nuclear activities. While optimal, this is unachievable, because Iran, like many other developing countries, insists on mastering fuel-cycle technologies. Even were it to surrender this aspiration, its indigenous know-how would enable it to revive its program at will, a temptation that might prove hard to resist, particularly if it is humiliated now. Nor is ceasing enrichment essential to ensure non-proliferation and the peaceful use of nuclear technologies: this is the IAEA's mission, which it can perform ably when given sufficient access and authority.¹⁶²

An approach based on the principle of denying Iran access to dual-use nuclear fuel cycle technology has only pushed it to dig in.¹⁶³ The challenge will be to explore the

¹⁶⁰ "Obama at Saban Forum", op. cit.

¹⁶¹ Josh Rogin, "Iran top nuke negotiator: Deal reversible in one day", DailyBeast.com, 16 January 2014. Supreme Leader Khamenei expressed a more pessimistic view, that the "the nuclear negotiations will lead nowhere". See Steven Erlanger, "Little Optimism as Iran Nuclear Talks Resume", *The New York Times*, 17 February 2014.

¹⁶² Two Israeli scholars wrote: "The international inspection mechanisms are not perfect and can always fail, as they did with regard to Iraq, Libya, North Korea, Syria, and Iran when they failed to discover in a timely manner these states' efforts to develop a covert military nuclear program". Amos Yadlin and Avner Golov, "The United States, Israel, and the Possibility of Formulating an Outline for a Final Agreement with Iran", Institute for National Security Studies, 30 April 2014. But these comparisons themselves are imperfect, as none of these countries were under rigorous IAEA inspections at the time of their covert nuclear activities.

¹⁶³ Expressing the position of his government, an Israeli official disagreed: "In principle we must rule out the approach that it is impossible to demand things that Iran would not accept. The idea that the gap has to be bridgeable is false. If it is bridgeable, it is excellent. Let's have a deal. But if it isn't, we shouldn't all lie to ourselves about it. You cannot reverse engineer a deal based on what is possible. You need to do the deal based on what is needed to resolve the problems". Crisis Group interview, Tel Aviv, 2 January 2014. For a more detailed Israeli rejection of the current diplomatic approach, see Yaacov Amidror, "Israel Cannot Accept the Emerging Accord between the US and Iran", Begin-Sadat Center for Strategic Studies, 24 April 2014.

middle-ground and craft an overall deal that the parties believe will serve their core interests, even if they object to certain components. For any accord to be more than a short-lived reprieve from the current tension, the negotiations should be guided by four objectives:

- ❑ erecting a firewall around Iran's civilian nuclear capabilities, by constraining the most proliferation-prone aspects of the nuclear program;
- ❑ enhancing the program's transparency, by establishing rigorous monitoring and verification mechanisms to establish confidence in the peaceful nature of Iran's nuclear activities;
- ❑ ensuring implementation of and deterring non-compliance with the agreement, by establishing objective and compulsory monitoring and arbitration mechanisms as well as by devising, in advance, potential responses to various sorts of breaches by either party; and
- ❑ bolstering the parties' incentives to remain faithful to the agreement, by introducing positive inducements and rehabilitating Iran's economy and international standing.

Format of the comprehensive agreement: The "final step" should be broken down into phases of different durations that would be conducive to the multi-layered nature of both the nuclear program and the sanctions regime; their rollback would need to happen in stages, with significant preparation time followed by a series of measures in rapid succession – a kind of punctuated equilibrium, as opposed to steady gradualism. This approach would also conform to political necessity, enabling front-loading of the agreement to rally support¹⁶⁴ by demonstrating tangible achievements early on; signalling regular progress throughout the duration of the final step; and postponing some difficult concessions until both sides have become accustomed to a new relationship. By contrast, should the agreement be configured as a single phase of sequential steps over a long duration, progress would appear slow and restraints stifling.

The "final step", during which the obligations defined in the comprehensive agreement are to be implemented, could be divided into three phases:

- ❑ In the first phase (one to two years), both parties would immediately execute short-term measures that would change the Iranian nuclear program's complexion and relax some sanctions with palpable impact on Iran's economy.
- ❑ The successful completion of this phase should pave the way for the second phase (with a duration of five to seven years), by generating sufficient momentum, goodwill and credibility for both parties to bring their respective legislatures on board and enact longer-term commitments and concessions.
- ❑ In the final phase (with a duration of eight to ten years), provided that the IAEA confirms the peaceful nature of Iran's nuclear program, some constraints on the program could be relaxed, the remaining sanctions could be phased out, and inspections could revert gradually to a more standard IAEA routine. Following this phase, which would conclude a fourteen- to nineteen-year process in total, the Ira-

¹⁶⁴ Crisis Group interviews, U.S., European and Iranian officials, Vienna, April 2014.

nian nuclear program would be treated in the same manner as that of any non-nuclear weapon NPT member state.

In addition to these finite obligations as defined by the JPOA, both sides could offer additional, voluntary, open-ended assurances to further increase the confidence of the other by reducing the ability to backtrack. These open-ended assurances should be made upon signing the comprehensive agreement.

Iran should reaffirm – as it has done in every nuclear agreement with the West – that in accordance with the Supreme Leader's *fatwa*, it will never seek or develop nuclear weapons.¹⁶⁵ To give teeth to this and guarantee its nuclear material will remain in all circumstances under IAEA supervision, it should implement facility-specific safeguards, as defined in the IAEA's Information Circular 66 (INFCIR/66), at all current enrichment and nuclear fuel fabrication facilities and commit to do the same at any future facilities it may establish.¹⁶⁶ It also could declare it will not reprocess spent fuel (an Open Fuel Cycle), either by constructing a reprocessing plant or by using shielded containers known as "hot cells", to alleviate concerns over a possible plutonium path to a bomb.¹⁶⁷ It could further pledge to maintain a "zero-stockpile" of enriched uranium at all times by converting, as quickly as possible and in agreement with the P5+1, any stockpile of fissile material in uranium hexafluoride or uranium oxide powder form to nuclear fuel rods, so as to remove any material readily available for further enrichment to weapons-grade,¹⁶⁸ and vow not to build a re-conversion line for reversing this process.

None of these measures imply forfeiting the right to engage in nuclear fuel cycle activities, but rather constitute self-restraint in their practice. Since they would erect obstacles to building a nuclear weapon, Iran could frame them as setting a new non-proliferation standard. It thus could position itself as a pioneering state – pushing,

¹⁶⁵ Even before becoming president, Rouhani highlighted the *fatwa*'s importance: "this *fatwa* is more important to us than the NPT and its Additional Protocol, more important than any other law". *Mehr Nameh Magazine*, May 2012. For a more sceptical view, see Michael Eisenstadt and Mehdi Khalaji, "Nuclear Fatwa: Religion and Politics in Iran's Proliferation Strategy", The Washington Institute for Near East Policy, Washington, September 2011.

¹⁶⁶ Article X.1 of the NPT allows a state to cite its supreme national interests and depart the treaty on three months' notice. Because Comprehensive Safeguards Agreements under IAEA INFCIR/153 are linked to the NPT, a withdrawal from the treaty would automatically stop application of these safeguards. As long as Iran remains a party to the NPT, INFCIR/66 will be subsumed by INFCIR/153. See Pierre Goldschmidt, "The Urgent Need to Strengthen the Nuclear Non-Proliferation Regime", Carnegie Endowment for International Peace, January 2006.

¹⁶⁷ Twice in 2005, Iranian nuclear negotiators offered such commitment to their European counterparts. "Proposal by Iran in the meeting of steering committee", Paris, 23 March 2005; London, 29 April 2005; Kelsey Davenport, "History of Official Proposals on the Iranian Nuclear Issue", Arms Control Association fact sheet, January 2014. Still, a senior Iranian official argued, "our scientists are against depriving ourselves permanently from conducting non-nuclear-weapons-related research on plutonium, but the real question is what kind of commitment the West is prepared to offer in return?" Crisis Group interview, Vienna, April 2014.

¹⁶⁸ In 2005, Iran pledged to convert any stockpile of low-enriched uranium into fuel rods in a specified short period of time and not build any reconversion lines. "Proposal by Iran in the meeting of steering committee", op. cit. Oxidisation of uranium hexafluoride renders the fissile material less amenable to weaponisation. As estimated by the Institute for Science and International Security, reconverting this into gaseous uranium hexafluoride for further enrichment would add "a few weeks to several months" to breakout times. "Iranian Breakout Estimates", op. cit. Mixing additives and sealing the fuel pallets with metallic alloy cladding to produce fuel rods further diminish immediate availability for further enrichment to weapons grade.

for instance, toward a Zone Free of Weapons of Mass Destruction in the Middle East¹⁶⁹ – as opposed to a rogue state submitting to discriminatory measures.¹⁷⁰

In return, the P5+1 should immediately endorse the agreement in a new UN Security Council resolution. It should also provide legally-binding guarantees to facilitate Iran's access to fuel for nuclear power and research reactors;¹⁷¹ pledge to refrain from imposing additional nuclear-related sanctions;¹⁷² and provide a security guarantee by categorically rejecting any threat or use of force against nuclear facilities determined by the IAEA to be exclusively devoted to peaceful purposes and stating that any such coercive action would violate the principles of international law, and specifically the UN Charter and IAEA Statute.¹⁷³

Oversight mechanism: Given the complexity and duration of the agreement, it is important to have an impartial, balanced mechanism to oversee implementation of commitments, clarify ambiguities, expedite resolution of problems and bring unresolved disputes to relevant authorities. While the IAEA can verify Iran's actions, there will be a need for an equal verification mechanism to address Iran's concerns. The Joint Commission, created under the JPOA, has serious flaws. It takes decisions by consensus, but, composed of six world powers and Iran, it is inherently unbalanced. Its record in monitoring JPOA implementation demonstrates its shortcomings: it did not deal effectively with problems in repatriation of Iran's unfrozen assets.¹⁷⁴

An alternative formula could be an Oversight Committee of nine arbitrators: three appointed by Iran, three by the P5+1 and three (neither Iranian nor P5+1 nationals,

¹⁶⁹ See "Establishment of nuclear-weapon free zone in the region of the Middle East", UN General Assembly Resolution 3263 (XXIX), 9 December 1974. Rouhani's former deputy, Hossein Mousavian, said, "Iranians are very sensitive to any measure that could be perceived as discriminatory, so any commitments beyond Iran's NPT obligations ought to be portrayed in a constructive light". Crisis Group interview, Istanbul, 21 February 2014.

¹⁷⁰ Some base opposition to an Iranian nuclear program not on suspicion of Iran per se but on its eroding of U.S. non-proliferation standards, leading to spread of dual-use technology across the region. That fear is reasonable but overstated. The non-proliferation standards critics refer to are those of the "123 Agreement", which provides U.S. nuclear assistance to countries developing a civilian program in return for accepting such constraints as forgoing enrichment and reprocessing. But those standards apply only to countries that benefit from U.S. nuclear aid, which Iran does not, so an Iranian nuclear program does not ipso facto undermine U.S. standards. Kingston Reif, "A necessary evil", *Bulletin of the Atomic Scientists*, 22 January 2014.

¹⁷¹ The P5+1 offered a similar commitment to Iran in UN Security Council Resolution 1747, as outlined in "Elements of a long-term agreement", its Annex II. To implement this commitment, Russia would have to sign a new contract for the Bushehr power plant to guarantee fuel supply during the reactor's entire lifespan. All other nuclear reactor vendors to Iran should pledge to provide fuel for their lifespan or deposit a few years supply in a future IAEA nuclear fuel bank.

¹⁷² This commitment should be consistent with the respective prerogatives of the executive and legislative branches of the parties' national governments.

¹⁷³ See "Prohibition of all armed attacks against nuclear installations devoted to peaceful purposes whether under construction or in operation", IAEA, GC (XXXIV)/RES/533, 21 September 1990; and GC (53)/DEC/13, 18 September 2009. This might appear pro forma, but an Iranian official said, "one should not underestimate the psychological effects of years of veiled and open threats of the use of military force against Iran's nuclear infrastructure". Crisis Group interview, Istanbul, November 2013. It could also serve as a warning to other actors not to take unilateral action. Crisis Group interview, former EU official, Istanbul, April 2014.

¹⁷⁴ Crisis Group interviews, Iranian, European and U.S. officials, Vienna, February-April 2014; Laurence Norman, Nour Malas and Benoit Faucon, "Iran Can't Withdraw Much Oil Revenue Under Interim Nuclear Deal", *The Wall Street Journal*, 6 April 2014.

in their personal capacities) appointed by the first six.¹⁷⁵ This would allow the main P5+1 elements (U.S., EU, Russia/China) to each have a representative, balanced by an equal number of Iranians; assuming internal unanimity among the blocs, the neutral appointees would in effect determine disputes. To address concerns the committee could muddy decision-making and become a pretext for delay, it should identify possible infringements in advance.¹⁷⁶ Such a mechanism might not guarantee that either party would have the political will to respond decisively to violations but could clarify ambiguities and at least render inaction more politically costly.

To deter non-compliance: Both Iran and the P5+1 could clarify the consequences of the other's renegeing on commitments. This would be delicate, as it could generate bellicose rhetoric and threats that might undermine the positive spirit of the agreement.¹⁷⁷ Prior authorisation of military force, as suggested by some U.S. experts,¹⁷⁸ likely would do more harm than good. At best it would have an uncertain benefit. Advocates of a military response to an Iranian dash for nuclear weapons believe no further legitimisation of a strike is necessary, whereas for those doubtful of U.S. and Western resolve, no additional assurance would be sufficient. Conversely, the risks of pre-emptive legislation are plain: it would enable hardliners in Tehran to accuse their negotiators of compromising under coercion. Should they attempt to mobilise their own coalition promising reciprocal retaliation, the resulting escalation could easily torpedo the talks.

Instead, the P5+1 could devise "snap-back" mechanisms for removed or suspended sanctions or plan for fast-tracking new ones, should Iran be found in material breach.¹⁷⁹ The Iranian parliament could pass an equivalent measure to suspend voluntary cooperation with the IAEA or remove constraints on the scale and scope of its nuclear program.¹⁸⁰ The Security Council could also devise "snap-back" mechanisms and is-

¹⁷⁵ The lead arbitrators could be supported by nuclear and sanctions experts. The Oversight Committee hears the parties' concerns and cases of complaints or non-compliance reported by the parties or the IAEA; and refers unresolved disputes to the political directors and the foreign ministries of Iran and the P5+1. The Oversight Committee also determines whether each phase of the agreement has been successfully completed.

¹⁷⁶ Both parties appear reluctant to lose control to an independent body. Crisis Group interviews, Iranian and European officials, Vienna, April 2014. Yet, if its judgments are to be taken seriously, the committee will have to be viewed and act objectively. Examples of clear violations would include conducting specific experiments known to be associated with nuclear weaponisation; delaying inspectors' access to nuclear facilities beyond 48 hours; enrichment above agreed levels; reconvertng oxidised enriched uranium to uranium hexafluoride gas; discrepancy in material or equipment accountancy; delays in repatriation of frozen assets; delays in shipping nuclear fuel to Iran; and many more. An Israeli official expressed concern that defining specific breaches in advance could create a situation in which everything else seemed allowed. Crisis Group interview, Jerusalem, 13 April 2014. To address this concern, the Oversight Committee should be empowered to examine other unforeseen breaches on a case-by-case basis.

¹⁷⁷ Crisis Group interviews, U.S. and Iranian officials, Vienna, April 2014.

¹⁷⁸ Jay Solomon, "Iran Must See Ramifications if Nuclear Talks Fail, Former Advisers Say", *The Wall Street Journal*, 4 April 2014. The threat would appear to be illegal under Article 2 (4) of the UN Charter.

¹⁷⁹ Crisis Group telephone interview, Colin Kahl, former U.S. assistant secretary of defence and senior fellow, Centre for a New American Security, Washington, 14 February 2014.

¹⁸⁰ These measures should be consistent with Iran's realistic needs. Threats to enrich uranium to near weapons grade would be counter-productive and could turn into a *casus belli*.

sue a generic resolution defining actions that would constitute a dash toward nuclear weapons and their consequences.¹⁸¹

Uranium enrichment: Despite the difficulty of using breakout capacity as a meaningful measure of Iran's nuclear program and the lack of consensus on Iran's practical needs, both concepts have wide backing among significant segments of mainstream expert opinion.¹⁸² In concert, they form the building blocks of what could be called a contingency enrichment program. Tehran would be permitted to maintain an enrichment capability that could be dialled up in the event of nuclear fuel denial, though that program would be constrained in such a manner that any breakout could be promptly detected and, through a defined response, thwarted. While any restriction on enrichment will be hard for Iran to accept, it might be more inclined to agree were it entitled to gradually increase the level as the sides made progress in implementing the final step and, given the importance of science in the national consciousness, were activities under the rubric of research and development to continue, albeit with restrictions.

Under such an approach, Iran would cap its enrichment capacity at 5 per cent for the duration of the final step, thus maintaining a clear distance from weapons-usable uranium. A dignified solution for rolling back Iran's enrichment capacity would allow it to maintain roughly the current number of its operational centrifuges (around 9,000 out of 19,000 installed) by trading-off between constraints on the size of stockpile of enriched material and the number of working centrifuges. If Iran limits its total enrichment capacity in the first phase of the agreement to 6,400 SWU per year in one facility (assuming that it has no working stockpile of enriched uranium to give it a head start), its approximate breakout time would be nine months.¹⁸³ Iran would

¹⁸¹ Some permanent Security Council members might hesitate to limit their diplomatic flexibility by drawing too many redlines in advance. The solution could lie in leaving some room for manoeuvre by using general terminology in conformity with Articles 41 and/or 42 of Chapter VII of the UN Charter (Article 41 refers to measures, short of force, the Security Council might draw on to address threats to peace and security; Article 42 discusses the use of force in situations where other measures are deemed not to have worked.) For a more specific proposal, see Goldschmidt, "The urgent need to strengthen the nuclear non-proliferation regime", *op. cit.*

¹⁸² On breakout capacity, see pp.19-20 above. A U.S. congressman demonstrated why it has become so prominent in public discourse when he said, "my colleagues are often at a loss on the technical nuances. What they understand, however, is how long it takes for Iran to make a nuclear bomb and how thorough the inspections are". Crisis Group telephone interview, Washington, March 2014. Barbara Slavin, "Gatekeeper experts key to nuclear deal with Iran", *Al-Monitor.com*, 17 March 2014. On practical needs, see arguments presented on p. 17.

¹⁸³ This Separative Work Unit Capacity (SWU per year) represents the total enrichment capacity of 8,000 IR-1 centrifuge machines (slightly fewer than the number of Iran's currently operating centrifuges), which could be dedicated entirely to meeting the fuel needs of the Arak reactor (in the event it is converted to operate on low-enriched uranium) or any other research reactor sold to Iran by the P5+1. The breakout time of nine months is based on a four-step process that uses natural uranium as feed with tail assays of 0.4 per cent. Average SWU of an IR-1 centrifuge was conservatively considered 0.8 (The average real SWU in 2013 was reported at 0.76. See David Albright, Christina Walrond, and Andrea Stricker, "ISIS Analysis of IAEA Iran Safeguards Report", Institute for Science and International Security, 20 February 2014). These estimates are based on calculations by Steve Fetter of the University of Maryland; Crisis Group email correspondence, 3 February 2014; and Scott Kemp, "Setting a goal for Iran talks", *Arms Control Wonk*, 10 October 2013. If Iran deploys more powerful centrifuges, it should adjust their numbers to remain below this SWU threshold. For example, the same threshold corresponds to 1,600 IR-2 centrifuges, assuming their average real

relocate any centrifuges above this threshold from Fordow and Hall A in Natanz to Hall B in Natanz for storage under the IAEA's seal, preferably monitored by remote surveillance.¹⁸⁴

Meanwhile, Iran's working stockpile of 5 per cent enriched uranium – currently available for further enrichment – could be eliminated by turning it into the reactor fuel that Iran seeks and that, in the form of fuel, would not pose an imminent risk: either Russia could cooperate with Iran to develop a dedicated line for the production of the Bushehr reactor's fuel in the Isfahan fuel production plant,¹⁸⁵ or the P5+1 could provide modern fuel manufacturing technology and designs for a future research reactor that operates on 5 per cent fuel.

In the second of the final step's three phases, Iran would be entitled to increase its contingent uranium enrichment capacity to no more than 9,600 SWU, still putting it six months away from a breakout.¹⁸⁶ In the final phase, Iran ought to voluntarily cap its uranium enrichment capacity at 19,200 SWU,¹⁸⁷ which, after nearly a decade of confidence building, would still keep its breakout time at three months – one month more than what it was during the JPOA's implementation. The output could be used, in cooperation with the P5+1, to make fuel for a small power plant or a research reactor. To alleviate concerns Tehran could use the agreement to gradually increase the efficiency of its centrifuges to edge closer to nuclear weapons capability during the years of heightened restrictions, it should cap the SWU capacity per centrifuge in its R&D sector at 5 SWU/year for the first and second phases and 10 SWU/year during the third phase.

Fordow: Crisis Group suggested in 2012 that Iran should convert Fordow into an R&D facility.¹⁸⁸ This would keep it open but concentrate the main enrichment activities in Natanz, rendering monitoring less burdensome. To assuage concerns that the facility could be used to dash toward nuclear weapons, only individual machines would be tested at this facility,¹⁸⁹ and the net enrichment output would be zero, which

SWU to be at 4. Average SWU capacity of more advanced centrifuges should be determined in the R&D sector by the IAEA.

¹⁸⁴ Hall B in Natanz remains empty and has the capacity to accommodate the excess centrifuges. Relocating the centrifuges, in contrast to dismantling them, would provide Iran with insurance against any failures in the agreement. It would also give the P5+1 more reassurance, as relocating the centrifuges would go beyond previously considered mothballing options that could be reconstituted relatively quickly. Laura Rozen, "The P5+1 nuclear proposal to Iran in Almaty: Document", *Al-Monitor*, 9 June 2013.

¹⁸⁵ A bilateral contract between Iran and Russia should protect Russia's commercial interests. Russia would still have to ship most of the BNPP's fuel needs (27 tonnes per year) to Iran.

¹⁸⁶ With no workable stockpile of low-enriched uranium, this limit represents a breakout time of six months corresponding to 12,000 IR-1 centrifuges. Iran could use some of its previously stored centrifuges or the newer models to elevate its capacity to the new threshold. Such a gradual increase in the number of centrifuges, which allows maintaining the narrative of progress, is essential from the perspective of Iran's internal politics. Importantly, Iran has had this theoretical breakout capacity since 2009, and thus a return to it after significant cooperation with the IAEA and implementation of enhanced safeguards in the first phase should be tolerable.

¹⁸⁷ With no workable stockpile of low-enriched uranium, this limit represents a breakout time of nearly three months corresponding to 24,000 IR-1 centrifuges. Iran could use some of its previously stored centrifuges or the newer models to elevate its capacity to the new threshold.

¹⁸⁸ Crisis Group Briefing, *The P5+1, Iran and the Perils of Nuclear Brinkmanship*, op. cit.

¹⁸⁹ This measure is aimed at alleviating breakout concerns. A European diplomat fretted: "The prospect of powerful new-generation centrifuge cascades in a bunkered facility in Fordow is unbearable for Israel, and frankly for us". Crisis Group interview, Vienna, 19 February 2014.

could be achieved by recombining the products and tails at the end of the process. Other non-enrichment related nuclear research also could take place at the facility. The more advanced machines could be tested in a maximum two interconnected cascades in Natanz, with the IAEA regularly evaluating their enrichment capacity.

Arak: Iran should modify the reactor, in cooperation with the P5+1, to a ten- or twenty-megawatt heavy-water reactor fuelled by near-5 per cent enriched uranium.¹⁹⁰ This solution would allow it to maintain its scientific achievements and heavy-water infrastructure, while reducing the weapons-usable plutonium in the spent fuel of the reactor due to its lower power and use of enriched uranium as fuel, thus offering Tehran the benefits of a safer, more modern and more efficient research reactor. Iran also should allow the Arak reactor to be monitored by in-house inspectors or remotely by cameras upon the introduction of nuclear material; agree to ship out the spent fuel as soon as it can be transported safely;¹⁹¹ and halt the natural uranium oxide (UO₂) fuel production line. In return, and in addition to the sanctions relief outlined below, the P5+1 should provide the reactor's fuel upon completion of its modification and sell Iran medical isotopes for its cancer patients.

Enhanced transparency measures: In the first phase, Iran should extend all the voluntarily transparency measures outlined in the JPOA and implement all elements of the yet to be ratified Additional Protocol and modified Subsidiary Arrangement Code 3.1.¹⁹² To guarantee that centrifuges are not destined for a clandestine facility as part of a sneak-out scenario, Iran should manufacture, assemble and test centrifuges and their parts only in locations open to IAEA inspections, allow the agency to tag the produced centrifuges for accountability purposes and declare its stocks of raw material such as carbon fibre and maraging steel. Moreover, Iran should limit mining, milling and conversion of uranium, throughout the final step, to levels commensurate with permitted enrichment activities and allow the IAEA to conduct regular material accountability measurements at its uranium conversion plant.¹⁹³

¹⁹⁰ With this modification, the reactor would produce less than a kilogram of plutonium per year. See Ahmad, von Hippel, Glaser and Mian, "A solution for Iran's Arak reactor", op. cit. This option appears mutually acceptable, as Iran would be able to maintain Arak as a heavy-water reactor, and the P5+1 could reduce its proliferation risks and avoid creating new 20 per cent fuel needs for Iran by converting Arak into a light-water research reactor. Crisis Group interviews, Iranian and European officials, Vienna, April 2014; email correspondence, Paolo Cotta-Ramusino, secretary general, Pugwash Conferences on Science and World Affairs, Milan, 23 April 2014; "Iran state TV says dispute over Arak nuclear plant 'virtually resolved'", *The Guardian*, 19 April 2014. To use Arak for breakout after this change, Iran would have to secretly build in advance a natural uranium fuel fabrication plant, reconvert the reactor's core, operate it for about nine months at full power, allow the spent fuel to cool down and, finally, reprocess it for a month in secretly constructed reprocessing facilities. The breakout time would be at least a year. Crisis Group email correspondence, Frank von Hippel, Princeton University professor, 10 March 2014; Crisis Group interview, Jim Walsh, MIT professor, Boston, 28 February 2014.

¹⁹¹ Like the Arak reactor, BNPP's spent fuel contains plutonium. If operated at 75 per cent capacity, it would discharge about 200kg plutonium per year in nineteen tonnes of spent fuel. Russia is contractually bound to repatriate the BNPP's spent fuel as soon as it can be safely transported (about five years after discharge). Crisis Group email correspondence, Anton Khlopkov, director, Centre for Energy and Security Studies, Moscow, 2 February 2014.

¹⁹² This would require Iran to inform the agency of any new nuclear facility when a decision to build is taken, as opposed to 180 days prior to introduction of nuclear material into it.

¹⁹³ These measures could help ensure nuclear material is not diverted to a secret enrichment program. The IAEA Board of Governors would have to authorise the additional inspections.

In the second phase, building on the momentum generated by the P5+1 fulfilling its commitments, Iran should present the Comprehensive Nuclear-Test-Ban Treaty (CTBT) to its parliament for ratification.¹⁹⁴ As extra guarantees, it also should adhere to the Nuclear Suppliers Group (NSG) guidelines; collaborate with the P5+1 to procure material and equipment needed for its peaceful nuclear activities; and establish export control programs.¹⁹⁵ By the end of this phase, the IAEA should be in a position to draw a broader conclusion regarding the completeness and correctness of Iran's declarations. In the beginning of the third phase, Iran should ratify the Additional Protocol and, on the basis of a mutually agreed schedule with the P5+1, begin to roll back transparency measures that exceed those defined by the Additional Protocol.¹⁹⁶

Possible Military Dimensions (PMD): A full resolution of these issues might not be possible because of Iran's political, religious and security constraints, but it should strive to satisfactorily resolve all past and present PMD-issues with the IAEA and take all the necessary corrective measures.¹⁹⁷ In order for the IAEA to conclude that it has no "serious concerns" about PMD issues – which is as much a political judgment as a function of Iranian cooperation¹⁹⁸ – it might be necessary for the IAEA, Iran and the P5+1 to jointly prioritise among the PMD issues, resolving those that most significantly contribute to a covert weapons program. During this process, the

¹⁹⁴ An expert wrote: "Today, Iranian ratification of the treaty – as well as a decision to allow the transmittal of data from international monitoring stations on its territory to the International Data Centre in Vienna – would help reduce concerns about Tehran's nuclear intentions and make it far harder for Iran to build a sophisticated nuclear arsenal". Daryl Kimball, "Keep the Middle East Nuclear Test Free", *Arms Control Today*, May 2014. The ratification should take place in parallel to passing sanctions relief legislation in the U.S. Congress and EU Council. This step would operationalise the Supreme Leader's *fatwa* against nuclear weapons. Both the Supreme Leader and Zarif played pivotal roles in Iran's joining the CTBT in 1996 as an original signatory. See Mohammad Mehdi Raji, *Mr. Ambassador* (Tehran, 2012), p. 206. Three seismic stations have been installed in Iran but are disconnected from the CTBT network. The CTBT text is at www.ctbto.org/fileadmin/content/treaty/treatytext.t.html.

¹⁹⁵ These measures are critical for Iran, as a state with significant nuclear know-how and infrastructure, to demonstrate its commitment to prevent proliferation of sensitive dual use technologies. The P5+1's nuclear cooperation with Iran should be conditioned on it adhering to these standards. A complete list of NSG guidelines is at www.nuclearsuppliersgroup.org/Leng/02-guide.htm.

¹⁹⁶ Iran could condition its ratification of the AP on the P5+1 delivering sanctions relief. Since inspections under the AP are resource intensive and burdensome, the IAEA offers integrated safeguards for those states in which the agency has resolved outstanding concerns and has determined that there are no undeclared nuclear materials and facilities. The integrated safeguards system reduces the overall frequency of inspections, instead providing assurances through unannounced random inspections and complementary access.

¹⁹⁷ Iran and the IAEA should develop special procedures for inspecting military and other sensitive sites. Current and ex-senior IAEA officials believe that with full cooperation and access to sites and scientists, all remaining Iran matters – as outlined in GOV/2011/65 by the IAEA – could be resolved in six to twelve months. Crisis Group telephone interview, January 2014; interview, Vienna, April 2014. Iranian officials concurred. Crisis Group interviews, Istanbul, February 2014. An IAEA official noted that the resolution of issues related to South Africa's military nuclear program required nearly two years to account for significant stocks of weapons-grade uranium. If it becomes clear nuclear material was not involved in PMD-related experiments, and given full cooperation and access, the agency could conclude the remaining Iranian issues quicker. Crisis Group interview, Vienna, April 2014.

¹⁹⁸ Mark Hibbs and Andreas Persbo, "Handling Iran's Weaponization File", *Arms Control Wonk*, 20 January 2014.

agency's independence would have to be respected.¹⁹⁹ The P5+1 should confirm that any IAEA report regarding the PMD issues will be relayed for informational purposes only to the agency's Board of Governors and the Security Council.²⁰⁰ To take account of Iran's reputational and national security concerns, all sides should pledge to maintain confidentiality.

UN Security Council Resolutions: As mentioned above, the Security Council will need to endorse the agreement reached between Iran and the P5+1. It should concurrently delist Iranian official organisations involved in the nuclear program (eg, the Atomic Energy Organisation of Iran) as well as the blacklisted Iranian banks.²⁰¹ The IAEA's determination, in the second phase of the final step, that Iran has no undeclared nuclear material and activities and those that it has declared are geared exclusively toward civilian use ought to satisfy the Council's requirement of establishing "international confidence in the exclusively peaceful nature of Iran's nuclear program" – even as Iran continues to enrich.²⁰² As for its ballistic missile program, Iran could sign The Hague Code of Conduct against Ballistic Missile Proliferation (HCOC) as a confidence-building measure.²⁰³

The third phase of the final step (six to nine years after signature of the comprehensive agreement) should begin with the Security Council adopting a resolution lifting the remaining UN sanctions, with the exception of measures on the procurement and export by Tehran of dual-use technologies,²⁰⁴ which would be lifted at the

¹⁹⁹ A former U.S. nuclear negotiator suggested that the IAEA should "focus most heavily on those aspects that have the most serious implications for a possible future covert weapons program and are most relevant to the successful design of a nuclear explosive device". Einhorn, "Preventing a nuclear-armed Iran", p. 26, op. cit. An IAEA official said, "it is important for the IAEA to maintain its independence, as it is only accountable to the agency's Board of Governors". Crisis Group interview, Vienna, April 2014.

²⁰⁰ This measure signifies granting Iran a grace period during which it would not be penalised should it voluntarily disclose information that could be considered self-incriminating. See Pierre Goldschmidt, "The Iranian Nuclear Issue: Achieving a Win-Win Diplomatic Solution", Carnegie Endowment for Peace, 4 February 2012.

²⁰¹ "The UN sanctions are such a symbol of hostility (and lack of respect) of the West to Iran that there needs to be some measure of their relaxation in the early stages of the agreement", Crisis Group email correspondence, William Luers, director, Iran Project, 26 April 2014. A former Iranian official confirmed the importance of lifting some UN sanctions early on. Crisis Group telephone interview, April 2014.

²⁰² George Perkovich, "Crafting a well-rounded nuclear deal with Iran", *Arms Control Today*, 19 March 2014.

²⁰³ Crisis Group email correspondence, Greg Thielmann, Arms Control Association, Washington, 11 March 2014. As a sovereign state, Iran has the right to develop defensive deterrence capabilities. By signing the HCOC, Iran would join the treaty's other 137 signatories. HCOC provisions include commitments to provide pre-launch notifications of ballistic missile and space-launch vehicles and submission of an annual declaration of the country's related policies. The text of the treaty is at www.hcoc.at/documents/Hague-Code-of-Conduct-A_57_724-English.pdf. Lifting the arms embargo imposed by UNSCR 1747 could be conditioned on Iran's signing of the HCOC or providing clarifications to the IAEA regarding experiments on nuclear warheads. Chief U.S. nuclear negotiator Wendy Sherman recently said, "if we are successful in assuring ourselves and the world community that Iran cannot obtain a nuclear weapon, then them not having a nuclear weapon makes delivery systems almost – not entirely, but almost – irrelevant". "Negotiations on Iran's nuclear Program", hearing, U.S. Senate Committee on Foreign Relations, 4 February 2014.

²⁰⁴ UN Security Council Resolution 1737 exempts equipment related to light-water reactors and low-enriched uranium from sanctions. Other material and equipment could be added to a white-list to facilitate the P5+1's nuclear cooperation with Iran.

end of the third phase, after Iran has built sufficient trust and honed its export control of sensitive dual-use technologies.

Civil nuclear cooperation: In the first phase, the P5+1 and Iran could collaborate on safety for nuclear power plants and research reactors, assess risks and promote safety-oriented solutions. This would require Iran to ratify the 1994 IAEA Convention on Nuclear Safety.²⁰⁵ Other areas of cooperation could include nuclear applications in the fields of medicine and agriculture. Moreover, as mentioned above, Russia and other members of the P5+1 should provide Iran with modern nuclear fuel manufacturing technologies.

In the second phase, after Iran adheres to international export control standards, while reiterating the rights of NPT member states to access advanced peaceful nuclear power and research technologies,²⁰⁶ the P5+1 should negotiate and sign contracts with it for at least two additional light-water research reactors and two nuclear power plants.²⁰⁷ The exporting country also should pledge contractually to provide the necessary fuel for these reactors and repatriate the resulting nuclear waste. In addition to these incentives, the P5+1 could offer Iran cutting-edge renewable energy technologies. Such an incentive would simultaneously address Iran's energy demands and its claims that the West denies it access to modern technology. It would also set a useful precedent for other nuclear energy-aspiring states.

Sanctions relief: While the incremental nature of the final step allows sanctions relief to proceed in phases, the parties should agree at the outset on the scheduled rollback of specific provisions.²⁰⁸ In the first phase, as Iran takes significant steps to constrain its nuclear capabilities, the P5+1 would reciprocate with meaningful sanctions relief. It could do this while preserving the main sanctions infrastructure to ensure that Iran fulfils its commitments by extending, and in some cases expanding, the suspension of all sanctions outlined in the JPOA.²⁰⁹ Although the reversible na-

²⁰⁵ Iran is the only nuclear power country not a signatory to this convention. An official of its Atomic Energy Organisation said, "there has been so much bad blood by mistreating Iran and depriving it [of] the IAEA's workshops that we have had no motivation to sign any new nuclear conventions". Crisis Group interview, Istanbul, November 2013. In January 2013, Iran announced it had begun the internal legal procedure to accede. Mohammad Khazaee, "Nuclear Safety in Iran", *The New York Times*, 15 January 2013.

²⁰⁶ See Article IV of the NPT, in conformity with Articles I and II of the NPT.

²⁰⁷ President Rouhani wrote in his memoirs: "When we negotiated purchasing reactors from the European countries, they replied 'we do not have them, our companies do. We can give them a green light, but we cannot force them to sell them to you'". *National Security and Nuclear Diplomacy* (Tehran, 2011), p. 203 (in Persian, Crisis Group translation). To avoid similar issues, the P5+1 should streamline the necessary licensing, provide subsidies and offer tax breaks that could incentivise their companies to sign contracts with Iran.

²⁰⁸ A list of sanctions that could be considered nuclear-related is in Appendix B below.

²⁰⁹ These include halting pressure on Iran's existing oil clients; and permitting trade in petrochemicals, precious metals, the automotive industry and aviation safety. The petrochemical and auto sectors are Iran's second most important source of revenue and second largest employer, respectively. EU imports of Iranian petrochemical products, however, dropped from nearly \$1 billion in 2010 to about \$50 million in 2013. Brendan Daly, Shashank Shekhar and Andrew Allan, "Iran petrochemicals outlook", *Platts*, 5 March 2014. In 2011, the auto industry employed about two million people, accounting for some 3.5 per cent of the economy, but production fell by 45 per cent due to sanctions. See Ladane Nasser, "Iran Carmakers Offer Rouhani Speedy Peace Dividend After Geneva", *Bloomberg*, 10 December 2013. These measures could be suspended by presidential waivers in the U.S. and council regulations in the EU. In addition to precious metals, sanctions on trade of raw

ture of such measures might appear to Iran as one-sided, rolling back its enrichment capabilities is not entirely irreversible either.

As Iran reconverts its nuclear installations and relocates its centrifuges, the EU gradually should resume imports of Iranian petroleum,²¹⁰ and the P5+1 should release half its frozen oil proceeds in monthly instalments, allow repatriation of subsequent oil revenue and release the government assets impounded under (U.S.) Executive Order 13599.²¹¹ The U.S. and EU also could remove the ban on providing financial messaging services to Iranian banks and the U.S. ban on Rial trading.²¹² The U.S. should rescind the designation of Iran as a primary money-laundering concern and permit U-turn transactions in dollars.²¹³ The EU should lift the authorisation threshold for trade.²¹⁴ Both the U.S. and EU should further facilitate humanitarian trade on the basis of lessons learned during JPOA implementation.

After the initial phase – as the nuclear program changes complexion, longstanding disagreements (eg, the PMD issues) are resolved, and Iran ratifies the CTBT – the U.S. Congress and EU Council could either authorise lifting the nuclear-related sanctions (outlined in Appendix B below) based on an agreed schedule or pass open-ended waivers, which would constitute a middle ground between short-term waivers that are unlikely to have a real impact and lifting sanctions that could be difficult to

and semi-finished metals, and mining could be suspended. See “Guidance Relating to the Provision of Certain Temporary Sanctions Relief in Order to Implement the Joint Plan of Action Reached on November 24, 2013, Between the P5+1 and the Islamic Republic of Iran”, U.S. Departments of State and Treasury, 20 January 2014; Council Regulation 42/2014, Amending Regulation (EU) no. 267/2012 concerning restrictive measures against Iran, 20 January 2014.

²¹⁰ To resume European imports of Iranian oil, the EU will have to amend Council Regulation 267/2012. In parallel, President Obama should invoke the national security-based waiver pursuant to Section 1245 of the 2012 National Defense Authorization Act, which authorises sanctions exemptions for Iranian oil customers for renewable periods of 120 days.

²¹¹ Iran is estimated to have about \$100 billion of assets frozen in accounts abroad. Crisis Group interviews, Tehran, March 2014. This measure requires use of the waiver provisions of Section 1245 of the 2012 National Defense Authorization Act or Section 104(c) of the Comprehensive Iran Sanctions, Accountability, and Divestment Act. Delisting some Iranian banks from the list of sanctioned entities and coordination with European and Asian banks for facilitating the transfer of these assets is likely to be necessary. Allowing repatriation of revenue from Iranian crude oil sales requires waiver under Section 504 of the Iran Threat Reduction and Syria Human Rights Act. Releasing the impounded assets of the Iranian government will require rescinding Executive Order 13599.

²¹² Implementing this measure for the EU will require amending Council Regulation 267/2012, concerning restrictive measures against Iran, 23 March 2012. For the U.S., although Section 220 of the Iran Threat Reduction and Syria Human Rights Act requires reports on electronic payments systems such as the Society of Worldwide Interbank Financial Telecommunications (SWIFT), it does not mandate sanctions against such systems. Nevertheless, the necessary reassurances should be provided by the Treasury Department. To allow Iran to trade in its national currency, the Rial, the president should issue a waiver under Executive Order 13645.

²¹³ The former is a necessary measure to rehabilitate Iran in the global financial system. The U.S. Treasury Department can unilaterally withdraw the designation under the USA Patriot Act (31 U.S.C. 5318A). In 2008, it banned U.S. banks from clearing indirect dollar transactions for Iranian financial institutions, known as a “U-turn”. Revoking the ban on conducting dollar transactions would facilitate Iran’s access to hard currency through tertiary banks. For background information, see “Revoking an authorization previously granted to U.S. depository institutions to process U-turn transfers”, U.S. Treasury Department, 6 November 2008.

²¹⁴ The EU mandates notification for transfers of over €10,000 and authorisation for those in excess of €40,000 in trade categories not prohibited by any sanctions legislation. The JPOA increased both thresholds ten-fold. Rescinding the restriction requires amending EU Council Regulation 267/2012.

reinstate.²¹⁵ In both cases, the legislation could specify that the repeal or waivers would be contingent on the Oversight Committee and the IAEA confirming Iran's compliance with its commitments. Priority should be given to relaxing restrictions on investment and provision of goods and services destined for Iran's petrochemical sector.²¹⁶ The P5+1 also should release, incrementally, the remainder of Iran's frozen assets and gradually relax all restrictions on its oil exports.²¹⁷

The final phase could commence, in parallel to Iran's ratification of the Additional Protocol, with the EU and other willing partners developing a strategic energy partnership with Iran through a Trade and Cooperation Agreement and declaring that they regard Iran as a long-term supplier of fossil energy.²¹⁸ The P5+1 next could further relax sanctions on investment in and provision of goods and services to Iran's natural gas sector,²¹⁹ and eventually to the country's oil sector.²²⁰ By the end of this step, all the remaining nuclear-related sanctions should have been removed.

²¹⁵ When it comes to U.S. sanctions, given Congressional resistance to lifting and the burden of continuously renewing short-term waivers – themselves subject to Congressional action – open-ended waivers could be a practical solution. In like manner, they would positively impact the risk assessment of companies reluctant to re-engage Iran because of uncertainty associated with short-term measures and reassure Iran of the West's intention to fulfil its commitments.

²¹⁶ Section 201 of the Iran Threat Reduction and Syria Human Rights Act modified Section 5(a) of the Iran Sanctions Act, banning provision of more than \$250,000 (or \$1 million in a one-year period) worth of goods or services for maintaining or expanding Iran's petrochemical industry. The U.S. president can waive these sanctions for a renewable one-year period. To allow export of Iran's petrochemical products, the U.S. president will have to waive Executive Order 13622, as well as related provisions (in Sections 1244, 1246 and 1247) under the Iran Freedom and Counter-Proliferation Act of 2012 for a renewable period of 180 days. The EU Council would need to modify provisions under Council Decision 2012/35/CFSP and the related Council Regulations. This would allow Iran to reconstitute its lost oil production capacity but funnel it towards producing petrochemical derivatives. Access to modern technologies and catalysts could reduce the costs, and removal of restrictions on shipping and insurance could facilitate exports. Crisis Group telephone interview, Bijan Khajepour, managing partner, Atieh International, Vienna, 31 January 2014.

²¹⁷ Iran has lost nearly 1.5 million barrels per day of its petroleum export capacity since 2011.

²¹⁸ Similar measures were proposed to Iran by its European interlocutors in 2005. See "Communication dated 8 August 2005 received from the Resident Representatives of France, Germany and the United Kingdom to the Agency", IAEA, INFCIRC/651, 8 August 2005.

²¹⁹ Under the Iran Sanctions Act, as amended by the Comprehensive Iran Sanctions, Accountability, and Divestment Act of 2010, investment of \$20 million or more in Iran's energy sector is banned. The president could waive these measures for a year. Related measures in The Iran Freedom and Counter-Proliferation Act of 2013 should also be suspended. A renewable 180-day waiver based on U.S. national security considerations exists, but a more sustainable solution, as mentioned above, would be to obtain an open-ended Congressional waiver. According to recent estimates, Iran has the world's largest natural gas reserves, but it has not been able to cultivate its potential due to sanctions. "BP Statistical Review of World Energy", British Petroleum, June 2013. An energy expert said, "in developing its gas fields, Iran should not focus on its immediate monetary benefits. Instead, it should seek the strategic significance of developing the capacity that it could then use to produce a myriad of downstream products and increase employment in the sector". Crisis Group telephone interview, Bijan Khajepour, Vienna, 31 January 2014.

²²⁰ Sanctions on investment in Iran's oil sector could be relaxed after their natural gas equivalents, in order to reassure the P5+1 that it retains enough leverage to guard against any potential problem until the final stages of the last step.

V. Conclusion

Achieving an agreement along these lines will be difficult. The parties' misperceptions and faulty expectations have rendered them prone to overreaching, a tendency that has been encouraged by hardliners at home and in the region. To mitigate inevitable criticism, they will have to invest in clearly explaining the agreement's merits, especially in comparison to alternatives. All will need to beware, in selling the agreement, not to encourage the other side's hardliners through belligerent rhetoric or by crowing over an ostensible victory. Public relations experts on both sides could coordinate messaging or at least calibrate their own messages to the other's sensitivities.

Assuaging regional stakeholders will be especially challenging. In parallel to the nuclear talks, the U.S. will have to reassure its regional partners that it does not plan to disengage from the region and will remain committed to their security, while dissuading them against sabotaging the agreement.²²¹ Iran also will have to convince its neighbours that, as it is politically and economically rehabilitated, it will pursue non-confrontational policies. It could take low-cost yet meaningful confidence-building measures to demonstrate this intention, including, for instance, reaching out to Saudi Arabia by taking the unprecedented step of sending a personal envoy from the Supreme Leader to Riyadh; reducing its support for Shia militant groups in the region (especially in Syria); and, more generally, negotiating good neighbourly agreements based on the principle of non-interference with its neighbours. It will be no less critical for Iran and the U.S. to communicate, openly or secretly, to avoid misunderstandings, particularly with regard to regional politics.

Both sides have demonstrated that they realise the dangerous path that would await them should the talks collapse: for the U.S., possibly a war it does not want; for the P5+1, conceivably schisms and polarisation, leading to a breakdown of its united front;²²² and for Iran, the probability of even more crippling sanctions if the international community blames it for the failure. It also would face the possibility of a military strike that, even if unlikely to destroy its nuclear program, could set it back and cause enormous damage to the country and its people.

A return to the pre-JPOA status quo is as unattractive as it is unsustainable. A decade of mutual escalation has brought both sides closer to the edge, not to their objectives. The next few months will be critical, as they twist and turn the nuclear Rubik's cube to achieve a realistic deal with a strong base on which to build in the succeeding years. Without it, both will find themselves escalating in ways that harm themselves at least as much as their opponent.

Istanbul/Tehran/Geneva/Vienna/Brussels, 9 May 2014

²²¹ A former senior Israeli security official warned that "Israel will not be bound by a bad deal. If push comes to shove, we have a broad spectrum of options, from covert operations to political pressure that we can fall back on". Crisis Group interview, Istanbul, November 2013.

²²² The initialled energy-for-equipment barter deal between Moscow and Tehran, and Russia's public endorsement of Iran's position that its missile program should not be on the nuclear agenda, could be ominous signs. See Jonathan Saul and Parisa Hafezi, "Iran, Russia working to seal \$20 bln oil-for-goods deal – sources", Reuters, 2 April 2014; "Iran missiles not on nuclear talks agenda: Russia", Press TV, 24 April 2014.

Appendix A: Map of Iran's Nuclear Facilities



Based on UN Map No. 3891 Rev. 1 (January 2004). Boundaries, names and the designations used do not imply official endorsement or acceptance by the UN or Crisis Group.

- | | | |
|--|--|-----------------------------------|
| 1. Karaj Agricultural & Medical Center | 6. Isfahan Uranium Conversion Facility | 11. Darkhovin Nuclear Power Plant |
| 2. Tehran Research Reactor | 7. Fuel Manufacturing Plant | 12. Bushehr Nuclear Power Plant |
| 3. Fordow Fuel Enrichment Plant | 8. Natanz Fuel Enrichment Plant | 13. Gchine Mine |
| 4. Arak Heavy-Water Reactor | 9. Saghand Mine | |
| 5. Isfahan Nuclear Research Center | 10. Yellow Cake Production Plant | |

Appendix B: List of Nuclear-Related Iran Sanctions²²³

U.S. Congressional Legislations

Sanction	Section	Target	Suspension requirement	Lifting requirement
Foreign Operations Appropriations	7041 (c)	Refined petroleum products	None	Congressional Action
	7070(b)(1)	Russian nuclear assistance to Iran	Discretion of the President	Congressional Action
Iraq Sanctions Act of 1990	586G	Nuclear technology	Waiver	Congressional Action
Iran-Iraq arms non-proliferation Act of 1992	1603	Arms, nuclear technology	Waiver (6-12 months)	Congressional Action
	1604	WMD technology	Waiver (6-12 months)	Congressional Action
	1605	WMD technology	Waiver (6-12 months)	Congressional Action
Iran Sanction Act of 1996	5(a)	Petroleum and petro-chemical sectors	Waiver (6-12 months)	Presidential Certification ²²⁴
	5(b)(1)	WMD technology	Waiver (12 months)	Congressional Action
	5(b)(2)	Uranium mining, production, transportation	Waiver (12 months)	Congressional Action
Iran Nuclear Proliferation Prevention Act of 2002	1343(b)	IAEA nuclear technology assistance	None, but imposition at the Secretary of State's discretion	Congressional Action
Comprehensive Iran Sanctions, Accountability, and Divestment Act of 2010	104(c)(2)	Financial transactions	Waiver	Presidential Certification
	104(c)(4)	National Iranian Oil and Tanker Companies	Waiver	Presidential Certification
	108	Implementing UN sanctions	Discretion of the President	Presidential Certification
	303	WMD Technology	Waiver (12 months)	Presidential Certification
National Defense Authorization Act of 2012	1245(b)	Money laundering	Waiver (4 or 6 months)	Presidential Certification
	1245(d)(1)	Financial transactions	Waiver (4 or 6 months)	Presidential Certification
	1245(d)(3)	Petroleum exports	Waiver (4 or 6 months)	Presidential Certification

²²³ For more detail, see Crisis Group Middle East Report N°138, *Spider Web: The Making and Unmaking of Iran Sanctions*, 25 February 2013; Dianne E. Rennack, "Iran: U.S. Economic Sanctions and the Authority to Lift Restrictions", Congressional Research Service, 4 February 2014.

²²⁴ Presidential Certification: these sanctions may be terminated when the U.S. president certifies to Congress that Iran has ceased pursuit of WMD, has been removed from the list of state sponsors of terrorism and no longer poses a national security threat to the U.S. and its allies.

Iran Threat Reduction and Syrian Human Rights Act of 2012	211	Shipping insurance for dual-use technology	Waiver	Presidential Certification
	212	Oil shipping insurance	Waiver	Presidential Certification
	213	Iran's sovereign debt	Waiver	Presidential Certification
	217	Iran's Central Bank	Presidential	Presidential Certification
	218	Financial transactions	Waiver	Presidential Certification
	220	Financial messaging	Discretion of the President	Presidential Certification
	221(1)	Officials involved in the nuclear program	Waiver	Presidential Certification
	302	Financial transactions	Waiver	Presidential Certification
	303	UN sanctioned entities	Waiver	Discretion of the President
	501	Education in sensitive fields	None	Presidential Certification
	504	Repatriation of oil revenue	Discretion of the President	Congressional Action
Iran Freedom and Counter-Proliferation Act of 2012	1244 (c)(2)(A)	Shipping and shipbuilding sectors	Waiver (6 months)	Congressional Action
	1244 (c)(2)(B)	Port sector	Waiver (6 months)	Congressional Action
	1244 (c)(2)(C)	Financial transactions	Waiver (6 months)	Congressional Action
	1244 (d)(1)(A)	Energy and shipping sectors	Waiver (6 months)	Congressional Action
	1245 (a)(1)	Precious and semi-finished metals	Waiver (6 months)	Congressional Action
	1246 (a)(1)	Insurance services	Waiver (6 months)	Congressional Action
	1247 (a)	Financial transactions	Waiver (6 months)	Congressional Action

U.S. Executive Orders

Sanction	Target	Suspension requirement	Lifting Requirement
E.O. 12938	Foreign aid, credits, arms	Discretion of the President	Discretion of the President
E.O. 12957	Petroleum sector	Discretion of the President	Congressional Action
E.O. 12959	Petroleum sector	Discretion of the President	Discretion of the President
E.O. 13382	Asset freeze	Discretion of the President	Discretion of the President

E.O. 13574	Loans, financial transactions	Discretion of the President	Congressional action
E.O. 13590	Energy and petrochemical sectors	Discretion of the President	Congressional Action
E.O. 13599	Asset freeze, Central Bank	Discretion of the President	Presidential Certification
E.O. 13622	Financial transactions	Discretion of the President	Discretion of the President
E.O. 13628	Financial transactions, asset freeze, arms	Discretion of the President	Congressional Action
E.O. 13645	Iranian currency, financial transactions	Discretion of the President	Discretion of the President

EU Restrictive Measures

Sanction	Target	Suspension requirement	Lifting requirement
Council Common Position 2007/140/CFSP, Council Regulation 423/2007	Arms, financial transactions, asset freeze	Unanimous EU Council decision	Unanimous EU Council decision
Council Decision 2010/413/CFSP, Council Regulation 961/2010	Arms, dual-use technology, financial messaging and transaction, asset freeze, trade, transportation, energy and insurance sectors, education in sensitive fields	Unanimous EU Council decision	Unanimous EU Council decision
Council Decision 2012/35/CFSP, Council Regulation 267/2012	Arms, financial transactions, asset freeze, raw and semi-finished metals, oil and natural gas exports, energy, insurance, shipbuilding, and transportation sectors	Unanimous EU Council decision	Unanimous EU Council decision

UN Security Council Resolutions

Sanction	Target	Suspension requirement	Lifting requirement
Resolution 1737	Dual-use technology, asset freeze, education in sensitive fields	Security Council resolution	Security Council resolution
Resolution 1747	Dual-use technology, asset freeze, arms	Security Council resolution	Security Council resolution
Resolution 1803	Dual-use technology, asset freeze	Security Council resolution	Security Council resolution
Resolution 1929	Dual-use technology, financial transactions, asset freeze, arms	Security Council resolution	Security Council resolution

Appendix C: Basic Nuclear Jargon for Non-Specialists

A. Nuclear Materials

Uranium – Uranium occurs naturally. Uranium ore (containing as little as 0.1 per cent uranium) is mined, milled to produce a uranium oxide concentrate (“yellow-cake”) and refined into uranium dioxide. This can be used as fuel in some reactors (see “heavy-water reactors” below), but for most purposes uranium dioxide is converted into uranium hexafluoride (UF₆, a compound that can be a solid, liquid or gas) and then enriched to either reactor-grade or weapons-grade levels. The final step in a civilian program is the fabrication of fuel rods, using a variety of refined or enriched uranium types.

“Enrichment” means increasing the concentration of the isotope uranium 235 and reducing that of uranium 238. Natural uranium consists primarily of these two atomic forms (which have the same number of protons, but differing numbers of neutrons in each nucleus): only U-235 is capable of undergoing fission, the process by which a neutron strikes a nucleus, splitting it into fragments and releasing heat and radiation.

Low-enriched uranium (LEU), used as fuel (to heat water to steam to drive turbines) in most power-generating reactors, is produced by raising the natural concentration of U-235 (0.7 per cent) to between 3 and 5 per cent. Iran started enriching to 3.5 per cent in April 2006; in February 2010, it increased this percentage to 19.75 per cent (usually rounded up to 20 per cent). The latter activity was suspended as part of the agreement on 23 November 2013.

Highly-enriched uranium (HEU) is defined (for safeguards administration purposes) as that in which the percentage of U-235 has been increased to greater than 20 per cent. Iran is not known to have enriched uranium to over 20 per cent. Weapons-grade uranium is usually described as U-235 enriched to 90 per cent or higher. The IAEA has defined 25kg of HEU, or 8kg of either plutonium-239 or uranium-233, as a “significant quantity” – the UN Agency’s definition of the quantity of material needed to manufacture a nuclear device.²²⁵ However, some experts argue that a simple fission nuclear device could be constructed with as little as 3kg of weapons-grade plutonium or 2-7kg of HEU.²²⁶

Uranium is enriched by pumping uranium hexafluoride gas (UF₆) into a series of tall rotating cylinders that operate under vacuum. Centrifugal force draws heavier U-238 molecules toward the outside of the chamber, while lighter U-235 molecules remain in the centre. Standard centrifuge enrichment is easily modified to produce HEU. The modifications can be concealed because enrichment plants emit few, if any, strong signals such as uranium leakage, heat emissions, and electronic signals; and centrifuge cascades can be housed in small buildings, which are less vulnerable to detection by spy satellites.

Iran has several types of centrifuges. The most common, the IR-1, is based on an early Dutch design. Pakistani nuclear scientist Abdul Qadeer Khan stole the design, then sold it to Iran, Iraq, Libya, North Korea and possibly India. The IR-1 uses alu-

²²⁵ “IAEA Safeguards Glossary: 2001 Edition”, IAEA, International Nuclear Verification Series no. 3, June 2002, p. 23.

²²⁶ See Thomas B. Cochran and Christopher E. Paine, “The Amount of Plutonium and Highly-Enriched Uranium Needed for Pure Fission Nuclear Weapons”, National Resource Defence Council, 13 April 1995.

minium rotors between 10cm and 11cm in diameter. The centrifuge's peripheral velocity is ~350 m/s.²²⁷ The more advanced Iranian IR-2m centrifuge is based on a modified German design that uses a rotor of tough maraging steel²²⁸ and was sold by Pakistan's Khan to Iran in the mid-1990s.²²⁹ The rotors are estimated to be between 14.5 and 15cm wide. The IR-2m is capable of reaching 485 m/s. Iran has developed other more sophisticated iterations of these centrifuges in its Research and Development sector, namely the IR-4, IR-5, IR-6, IR-6s and IR-8. As of February 2014, Iran had installed or was testing 175 IR-4, one IR-5, seven IR-6, one IR-6s, and one IR-8 centrifuges.²³⁰

Plutonium – Plutonium occurs naturally only in minute proportions and, for the most part, is man-made.

Reactor-grade plutonium is produced by commercial power reactors as a normal by-product when some neutrons released during fissioning interact with other uranium atoms: some of the resulting product is itself fissioned, but a proportion remains in spent fuel rods in various isotopic forms (including Pu-239, Pu-240 and Pu-241), which when extracted chemically can be used as nuclear fuel.

The plutonium contained in the spent fuel rods of standard light-water reactors is typically about 60-70 per cent Pu-239; heavy-water reactors, by contrast, can produce Pu-239 in weapons-grade concentrations (but the brief irradiation required to achieve this is inefficient for power production). As noted, the IAEA has defined 8kg of plutonium as a "significant quantity", sufficient for a nuclear bomb.²³¹

B. Nuclear Reactors

There are two main types of reactors:

Light-water reactors (Iran's Bushehr plant, built by Russia): The most common reactors in operation today, light-water reactors use ordinary water as a coolant and low-enriched uranium as fuel. From a proliferation standpoint, light-water reactors are preferable to heavy-water reactors for two reasons: first, extracting the plutonium by-product requires shutting down the reactor, which is more easily detected; secondly, the plutonium produced as a by-product contains significant impurities, ie, low concentrations of Pu-239.

Heavy-water reactors (The heavy-water reactor under construction in Arak): These reactors use a coolant water containing an elevated concentration of "heavy hydrogen" (also known as deuterium) – atoms with a neutron in their nucleus in addition to the usual proton. This allows the use of natural (non-enriched) uranium as fuel.

²²⁷ Alexander Glaser, "Characteristics of the Gas Centrifuge for Uranium Enrichment and Their Relevance for Nuclear Weapon Proliferation (corrected)", *Science and Global Security*, vol. 16, no. 1 (2008), p. 8.

²²⁸ Tough but malleable "maraging" steel is considered a dual-use item, the export of which is controlled by the Nuclear Suppliers Group – a collection of nuclear supplier countries that contributes to non-proliferation of nuclear weapons through the implementation of guidelines for nuclear exports and nuclear-related exports, as well as through coordinated control lists of sensitive dual-use equipment. "Communication Received from Certain Member States Regarding Guidelines for the Export of Nuclear Material, Equipment and Technology", IAEA, Information Circular, 24 February 1998.

²²⁹ David Albright and Christina Walrond, "Iran's Advanced Centrifuges", Institute for Science and International Security, 18 October 2011.

²³⁰ "Implementation of the NPT Safeguards Agreement", IAEA, op. cit., 14 February 2014, p. 7.

²³¹ "IAEA Safeguards Glossary", op. cit., p. 23.

Spent fuel rods from heavy-water reactors produce – without the need for uranium enrichment – significant quantities of plutonium and are capable (though not when being used commercially) of producing Pu-239 in weapons-grade concentration. Some heavy-water reactors can be refuelled online – with no need for shutting them down – making detection of diversion more difficult.

C. *Relevant Treaties and Institutions*

The Treaty on the Non-Proliferation of Nuclear Weapons (Non-Proliferation Treaty, NPT) – An international treaty designed to halt the spread of nuclear weapons, promote the spread of peaceful nuclear technology and further the goal of disarmament. The NPT divides its signatories into two categories: the Nuclear Weapons States (NWS) and the Non-Nuclear Weapons States (NNWS). The five official nuclear weapons states²³² are the U.S., Russia, the UK, France and China. In exchange for agreeing not to pursue nuclear weapons, the NNWS are ensured access to nuclear technologies for peaceful use. The NWS are obligated to assist in the development of nuclear energy, while also working in good faith toward nuclear disarmament. The treaty was opened for signature in 1968 and entered into force in 1970.²³³ On 11 May 1995, it was extended indefinitely.

The International Atomic Energy Agency (IAEA) – The UN's nuclear watchdog, a Vienna-based international body with 162 member states. It is tasked with encouraging and assisting research, development and practical application of nuclear energy for peaceful uses throughout the world; establishing and administering safeguards designed to ensure that activity it assists does not further any military purpose; applying safeguards to relevant activities at the request of member states; and applying, under the NPT and other treaties, mandatory comprehensive safeguards in non-nuclear weapon states (NNWS) that are parties to such treaties.²³⁴ It is the principal source of information about Iran's nuclear program, through inspections of Iran's declared nuclear facilities on which its director regularly reports to its Board of Governors.

IAEA Safeguards System – Designed to prevent the diversion of fissile material from civilian use. According to NPT Article III, each non-nuclear-weapon State Party to the Treaty undertakes to accept safeguards, as set forth in an agreement to be negotiated and concluded with the IAEA in accordance with the Statute of the IAEA's safeguards system, for the exclusive purpose of verifying fulfilment of the State Party's obligations under the NPT to prevent diversion of nuclear energy from peaceful uses to nuclear weapons or other nuclear explosive devices. The exact details about how safeguards are applied are contained in the Agreement's subsidiary arrangements.

Additional Protocol – Requires states that accept it to provide the IAEA an expanded declaration that contains information covering all aspects of their nuclear fuel cycle activities; grant the IAEA broad access to all relevant locations and nuclear sites, and allow it to use all verification technologies; and streamline procedures for

²³² For NPT purposes, a nuclear-weapon state is one that has manufactured and exploded a nuclear weapon or other nuclear explosive device prior to 1 January 1967.

²³³ "Treaty on the Nonproliferation of Nuclear Weapons", INFCIRC/140, 22 April 1970.

²³⁴ "International Atomic Energy Agency (IAEA)", Inventory of International Nonproliferation Organisations and Regimes, James Martin Center for Nonproliferation Studies.

designating inspectors and for granting them long-term multiple entry visas.²³⁵ The Additional Protocol is voluntary; 122 of the 162 IAEA member states have committed to it, including all the main nuclear states. Iran agreed to implement the Additional Protocol in 2003 but said it would stop abiding by it in 2006, despite several UN Security Council resolutions mandating Tehran to implement it.

Code 3.1 – The subsidiary arrangement of a state's safeguards agreement with the IAEA that specifies when it must report a new facility to the IAEA. According to the original version of Iran's Code 3.1, agreed in 1976, it is obligated to report to the agency a new facility no later than 180 days before the introduction of nuclear material. In 2003, Iran began to implement the modified Code 3.1, as do most states with nuclear programs. Modified Code 3.1 requires submission of design information to the IAEA as soon as a new facility is planned. Tehran unilaterally revoked its implementation of the modified Code 3.1 in March 2007. The modified Code 3.1, like the Additional Protocol, is voluntary.

P5+1 – The group leading the international community's negotiations with Iran over its nuclear program, including the five permanent members of the UN Security Council – the U.S., China, Russia, UK and France – and Germany. It is led by the European Union's High Representative, Catherine Ashton. It is also known as the E3+3 or the EU/E3+3.

D. *Iran's Notable Nuclear Facilities*

Bushehr Nuclear Power Plant (BNPP): Iran's sole nuclear power plant on the Persian Gulf. Construction, started by a German company in 1975, was halted after the Islamic Revolution of 1979. A Russian company resumed work on the reactor in 1995 and changed its design to a 915 megawatt light water reactor (model VVER-1000). It became operational in September 2011. Russia provides the reactor's fuel and repatriates its spent fuel.

Tehran Research Reactor (TRR): The U.S. supplied Iran with a five-megawatt thermal pool type light-water research reactor, which became operational in 1967. Initially, the reactor ran on 93 per cent enriched fuel (HEU), but in 1987 Iran paid Argentina's Applied Research Institute to convert it to run on 19.75 per cent enriched fuel, which it has since 1988.

Natanz Enrichment Plant: Natanz is home to two different enrichment facilities: the large Fuel Enrichment Plant (FEP) and the smaller Pilot Fuel Enrichment Plant (PFEP). Iran also assembles its centrifuges at Natanz. The Fuel Enrichment Plant is buried deep underground, to protect it from air strikes, and consists of two large bunkers (Hall A and Hall B) that together could eventually hold 50,000 centrifuges.²³⁶ According to the most recent IAEA report, Iran has installed 54 cascades in total, containing 8,000 centrifuges, about three quarters of which are operational.²³⁷ The

²³⁵ "IAEA Safeguards Agreement and Additional Protocols: Verifying Compliance with Nuclear Non-Proliferation Undertakings", IAEA, www.iaea.org/Publications/Booklets/Safeguards3/safeguards0408.pdf.

²³⁶ "Natanz Fuel Enrichment Plant", Institute for Science and International Security (www.isisnucleariran.org/sites/facilities/fuel-enrichment-plant/), undated.

²³⁷ "Implementation of the NPT Safeguards Agreement", IAEA, op. cit., 8 November 2011, p. 3.

Pilot Fuel Enrichment Plant, also underground, is a much smaller research and development facility where Iran has installed its newer and more advanced centrifuges. The cascade hall is designed to house six centrifuge cascades.

Fordow Enrichment Plant: Iran informed the IAEA on September 2009 that it was in the midst of constructing a 3,000-centrifuge enrichment facility (in sixteen cascades) deep under a mountainside near the city of Qom. Iran began enriching to 19.75 per cent level in Fordow in January 2012 and completed installing all centrifuges in the facility by November that year. However, only four cascades were operational before activities were suspended in January 2013.

Heavy-Water Reactor (Arak): After successful small-scale experiments to produce heavy water, Iran decided in the mid-1990s to build an IR-40 (40-megawatt thermal) heavy-water moderated and cooled reactor. The reactor will be fuelled with natural uranium and produce plutonium Pu-239, ideal for some forms of nuclear weapons. Iran says that the Arak reactor will be used for research and development and radioisotope production.²³⁸

Heavy-Water Production Plant (Arak): Iran commissioned the heavy-water production plant in 2006. It is now operational and can produce sixteen metric tonnes of heavy water per year for use in the IR-40 heavy-water reactor under construction, also in Arak.²³⁹

Fuel Manufacturing Plant (Isfahan): The plant produces fuel rods for the Tehran Research Reactor and the IR-40 heavy-water reactor in Arak.²⁴⁰

Uranium Conversion Facility (Isfahan): The Uranium Conversion facility (UCF) began operation in 2006. The UCF is where Iran converts yellowcake into uranium dioxide, uranium metal and uranium hexafluoride (UF₆). The facility is able to convert yellowcake, Iran's 3.5 enriched UF₆ and its depleted uranium into uranium metal. The facility's annual capacity is 200 metric tonnes.²⁴¹

²³⁸ "IR-40", Nuclear Threat Initiative (www.nti.org/facilities/177/), undated.

²³⁹ "Heavy Water Production Plant (HWPP)", Nuclear Threat Initiative (www.nti.org/facilities/175/), undated.

²⁴⁰ Ivanka Barzashka and Ivan Oelrich, "Iran's Fuel Fabrication: Step closer to independence or a bomb?", Federation of American Scientists, 30 September 2009.

²⁴¹ "Uranium Conversion and Fuel Fabrication", Institute for Science and International Security (www.isisnucleariran.org/sites/by-type/category/uranium-conversion-and-fuel-fabrication/), undated.

Appendix D: About the International Crisis Group

The International Crisis Group (Crisis Group) is an independent, non-profit, non-governmental organisation, with some 120 staff members on five continents, working through field-based analysis and high-level advocacy to prevent and resolve deadly conflict.

Crisis Group's approach is grounded in field research. Teams of political analysts are located within or close by countries at risk of outbreak, escalation or recurrence of violent conflict. Based on information and assessments from the field, it produces analytical reports containing practical recommendations targeted at key international decision-takers. Crisis Group also publishes *CrisisWatch*, a twelve-page monthly bulletin, providing a succinct regular update on the state of play in all the most significant situations of conflict or potential conflict around the world.

Crisis Group's reports and briefing papers are distributed widely by email and made available simultaneously on the website, www.crisisgroup.org. Crisis Group works closely with governments and those who influence them, including the media, to highlight its crisis analyses and to generate support for its policy prescriptions.

The Crisis Group Board – which includes prominent figures from the fields of politics, diplomacy, business and the media – is directly involved in helping to bring the reports and recommendations to the attention of senior policy-makers around the world. Crisis Group is co-chaired by former UN Deputy Secretary-General and Administrator of the United Nations Development Programme (UNDP), Mark Malloch-Brown, and former U.S. Undersecretary of State and Ambassador Thomas Pickering. Its President and Chief Executive since July 2009 has been Louise Arbour, former UN High Commissioner for Human Rights and Chief Prosecutor for the International Criminal Tribunals for the former Yugoslavia and for Rwanda.

Crisis Group's international headquarters is in Brussels, and the organisation has offices or representation in 26 locations: Baghdad/Suleimaniya, Bangkok, Beijing, Beirut, Bishkek, Bogotá, Brussels, Cairo, Dakar, Dubai, Gaza City, Islamabad, Istanbul, Jerusalem, Johannesburg, Kabul, London, Mexico City, Moscow, Nairobi, New York, Seoul, Toronto, Tripoli, Tunis, Washington DC. Crisis Group currently covers some 70 areas of actual or potential conflict across four continents. In Africa, this includes, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Côte d'Ivoire, Democratic Republic of the Congo, Eritrea, Ethiopia, Guinea, Guinea-Bissau, Kenya, Liberia, Madagascar, Nigeria, Sierra Leone, Somalia, South Sudan, Sudan, Uganda and Zimbabwe; in Asia, Afghanistan, Indonesia, Kashmir, Kazakhstan, Kyrgyzstan, Malaysia, Myanmar, Nepal, North Korea, Pakistan, Philippines, Sri Lanka, Taiwan Strait, Tajikistan, Thailand, Timor-Leste, Turkmenistan and Uzbekistan; in Europe, Armenia, Azerbaijan, Bosnia and Herzegovina, Cyprus, Georgia, Kosovo, Macedonia, North Caucasus, Serbia and Turkey; in the Middle East and North Africa, Algeria, Bahrain, Egypt, Iran, Iraq, Israel-Palestine, Jordan, Lebanon, Libya, Morocco, Syria, Tunisia, Western Sahara and Yemen; and in Latin America and the Caribbean, Colombia, Guatemala, Mexico and Venezuela.

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Appendix E: Reports and Briefings on the Middle East and North Africa since 2011

Israel/Palestine

Gaza: The Next Israeli-Palestinian War?, Middle East Briefing N°30, 24 March 2011 (also available in Hebrew and Arabic).

Radical Islam in Gaza, Middle East/North Africa Report N°104, 29 March 2011 (also available in Arabic and Hebrew).

Palestinian Reconciliation: Plus Ça Change ..., Middle East Report N°110, 20 July 2011 (also available in Arabic and Hebrew).

Curb Your Enthusiasm: Israel and Palestine after the UN, Middle East Report N°112, 12 September 2011 (also available in Arabic and Hebrew).

Back to Basics: Israel's Arab Minority and the Israeli-Palestinian Conflict, Middle East Report N°119, 14 March 2012 (also available in Arabic).

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Light at the End of their Tunnels? Hamas & the Arab Uprisings, Middle East Report N°129, 14 August 2012 (also available in Arabic).

Israel and Hamas: Fire and Ceasefire in a New Middle East, Middle East Report N°133, 22 November 2012 (also available in Arabic).

Extreme Makeover? (I): Israel's Politics of Land and Faith in East Jerusalem, Middle East Report N°134, 20 December 2012 (also available in Arabic and Hebrew).

Extreme Makeover? (II): The Withering of Arab Jerusalem, Middle East Report N°135, 20 December 2012 (also available in Arabic and Hebrew).

Buying Time? Money, Guns and Politics in the West Bank, Middle East Report N°142, 29 May 2013 (also available in Arabic).

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The Next Round in Gaza, Middle East Report N°149, 25 March 2014 (also available in Arabic).

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Popular Protest in North Africa and the Middle East (VI): The Syrian People's Slow-motion

Revolution, Middle East Report N°108, 6 July 2011 (also available in Arabic).

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Now or Never: A Negotiated Transition for Syria, Middle East Briefing N°32, 5 March 2012 (also available in Arabic and Russian).

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Lost in Transition: The World According to Egypt's SCAF, Middle East/North Africa Report N°121, 24 April 2012 (also available in Arabic).

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Tentative Jihad: Syria's Fundamentalist Opposition, Middle East Report N°131, 12 October 2012 (also available in Arabic).

A Precarious Balancing Act: Lebanon and the Syrian conflict, Middle East Report N°132, 22 November 2012 (also available in Arabic).

Syria's Kurds: A Struggle Within a Struggle, Middle East Report N°136, 22 January 2013 (also available in Arabic and Kurdish).

Too Close For Comfort: Syrians in Lebanon, Middle East Report N°141, 13 May 2013 (also available in Arabic).

Syria's Metastasising Conflicts, Middle East Report N°143, 27 June 2013 (also available in Arabic).

Marching in Circles: Egypt's Dangerous Second Transition, Middle East/North Africa Briefing N°35, 7 August 2013 (also available in Arabic).

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North Africa

Popular Protests in North Africa and the Middle East (IV): Tunisia's Way, Middle East/North Africa Report N°106, 28 April 2011 (also available in French).

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Tunisia: Combatting Impunity, Restoring Security, Middle East/North Africa Report N°123, 9 May 2012 (only available in French).

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Iraq: Falluja's Faustian Bargain, Middle East Report N°150, 28 April 2014.

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