TIP Conference Call with Dr. Olli Heinonen

Omri Ceren: Thank you operator and thank you all for joining us on what I know is a very very very busy post-election news cycle. We don't have much time today with Dr. Olli Heinonen, so I wanted to give the briefest of introductions before turning it over to him. As you know, he is a 27-year veteran of the IAEA. He is a former deputy director at the Agency and he is one of the world's, if not the world's, foremost experts on how the kinds of verification schemes that are currently being discussed – well, they just finished being discussed in Oman and will soon be discussed in Vienna - how those verification schemes for assuring that a country's atomic program is for peaceful purposes, how they get implemented. And as you know, these are talks that are now coming down to the wire between the P5+1 and Iran. And that this in addition to the substantive issues of uranium and plutonium has become one of the key questions, which is to say when the Iranians sign a piece of paper promising concessions, how will those concessions be verified. If you have questions over the course of the call, please submit them to press@theisraelproject.org, press@theisraelproject.org and we will attempt to rush through as many as we can. On that note, I'll turn the call over to Dr. Heinonen for some opening remarks and then we'll go to questions.

Dr. Olli Heinonen: Thank you very much, Omri, and thanks for having me. So I'm not going to flood you with numbers but with the basic principles, how this long-term agreement should be set up and which should be the technical parameters in the program, in agreement for the uranium enrichment program and for the heavy-water reactor program, and how to deal with the possible military dimensions. And if you want to see the details, I just published last week a report which title is: "The Iranian Nuclear Program: Practical Parameters for a Credible Long-term Agreement." You will find it from the Belfer Center website in Harvard Kennedy School or the Henry Jackson Society in London. So this was a kind of joint work which I did with them.

So, here we are, two weeks to go, and what should be done in terms of the verification? And let me first address the uranium enrichment program of Iran. There are things which we know and there are things which we don't know. So therefore when one sets and agrees a number of centrifuges which Iran can run, one has to also to get some kind of assurances that these are all the centrifuges in Iran and there are no other ones, because this will have a tremendous impact on the breakout time. And how to do it, that's very simple. We know that they have 19 – 18,000 IR-1 centrifuges and 1,000 IR-2M centrifuges ,which are constructed from slightly different materials. And let's take as an example the 1,000 IR-2M centrifuges, what I need to do in order to ensure that there are no additional centrifuges somewhere else in Iran. First of all there

has to be some additional ones for two reasons, because when you are operating these centrifuges they get broken, so you need to always have that backup stock, let's say something like 10% at least for the annual need. So if you have 1,000 centrifuges operating, you must have a couple of hundred at least in your backyard somewhere waiting to be used to replace the broken ones. But you have, in order to do that you need to acquire also raw materials and there are indications that actually Iran has got some additional raw materials to manufacture this. So we need to understand how much raw materials they have for this IR-2 centrifuges, how much they have used, and how many centrifuges they have. And how to do it in practice is very simple. This was done in 2003 for the IR-1 centrifuges. You estimate how much you need, you have carbon-fiber in this case in your centrifuge rotor. You go to the manufacturing place, you look at their working permits, their working habits, then you see how much they have. Plus any [inaudible] etc. Then you look how many of these rotors will never pass the quality control. These are very difficult to manufacture so you have losses there. And then you have an estimate, first estimate, that's the material consumption which they present to you. Does it match with the number of rotors you see, with the discards which you see?

But you go actually a step forward here, because this is what Iran tells to you. What you need to do is to ask them how much they have ordered carbon-fiber, where did they order it, and when did it come, and where is this now. Then, based on your intelligence and other information, procurement information, because some of those procurements are also public, you will know whether this declaration is complete. And then you proceed same way, I talk now with the carbon fiber to do with all the major components of the centrifuge. Same way. Number of magnets, [inaudible] steel, [inaudible] all sensitive rotating components similar way. So if someone wants to give you a wrong picture on these centrifuges and the number of rotors it possesses, it's going to be very difficult because first of all the persons who provide this information, they don't know what you know, is the first thing because you may have some additional information, plus that, you know to falsify the whole production scheme for all these centrifuges will be extremely difficult. Almost you know, there is, as people say, there's no perfect crime and this is what is here. So once you have an understanding of the total number of centrifuges then you are much more comfortable in agreeing how many Iran should have operating.

The second thing is what you do. You do the same thing for the nuclear material. We know that they have 20% enriched uranium which they have turned partially to 20% enriched uranium oxide or diluted to low-end enriched uranium and they have also

produced the 3.5% enriched uranium which they have there in stock. But the question is, is this all the uranium which Iran has enriched. This IAEA has never verified, it has always certified that number which Iran has stated it has produced. Similar way, the IAEA has to have the right provisions in the agreement so that it can go to look what has been the historical production of enriched uranium in Iran. And again, this can be done and a good example of that was the work with IAEA for example in South Africa in 1993-1994, when it was verifying the dismantlement of, or dismantled the South African nuclear weapons program.

So there is a methodology there. So those two things actually need to be knowns and unknowns verified. Then you can agree how much uranium should stay at any given point of time in Iran, what should be shipped away for elsewhere, and how many centrifuges should be allowed to operate. And important also with these centrifuges is that this actually will definitely require this month, [inaudible] disabling of the centrifuges. The only way to do this properly is actually dismantle the extra centrifuges, which means in this case, about they have 17,000 of them, put them into storage somewhere in Natanz or wherever, and let the IAEA monitor that they stay there, like they had to monitor also those rotors which have been and centrifuges which had been manufactured. So then you start with a good clean baseline and you see how it proceeds. But this is not yet, unfortunately, sufficient in the case of Iran, because of this military dimension.

Again, one has to understand here, is Iran a screwdriver turn away from nuclear weapon capability or does Iran actually need to do a lot of development work in order to achieve that capability? And once you address that part, again you are much more comfortable in agreeing the number of centrifuges which stay operational and the amount of nuclear material which can be stored in Iran. And how to do that possible military dimension. This needs discussion with the Iranian scientists, understand what they have done, compare it to this information which the IAEA has, and then select certain choke points that from there - high explosive studies, missile [inaudible], etc - to see that this program is not reconstituted. This is the way that it was done in South Africa in '93-'94. IAEA has selected some places which it felt that if South Africa is going to reconstitute the program, there needs to be certain activities on those places and we will see it - the same principle. So you cannot solve this problem without having some solution, verified solution which verifies the activities on this area of possible military dimension the way they have been described in November 2011 report of the IAEA. No such step what has been reasoned to talk on those steps which have been taken based

on the November '13 report, agreement of last year, framed their cooperation. This is only the surface of the bigger problem of that agreement.

I did mention irreversibility. Irreversibility is also important for the heavy-water reactor. It needs to be modified in such a way that it would be very difficult to put it back to operate as a heavy-water reactor, and I think that this proposal, for example, from Princeton University scholars is perhaps not ideal for that, this. I think we should really make it a light-water reactor with a very small core like any other country who produces medical isotopes and uses research reactor to train the people. The scale of perhaps 10 megawatts or so, and once you do this transformation, you do it in such a way that it will be almost impossible to turn it into the reasonable manufacture of the heavy-water reactor. And at the same time, you change it from heavy-water reactor to light-water reactor. There's no need to have heavy-water in Iran. They can sell their stocks to the world market at 90 tons, which they have. They don't need any more heavy water.

So these are I think at the basic things which I have in mind for a good agreement and more details on the rationale and parameters you will find on that 20-page report, which I mentioned. And I think that I have spent already quite a lot of time to explain it but a couple of words still about the breakout times or the principle of breakout. I refer to the statement made by Secretary Kerry a couple of weeks ago, when he said talk about breakout time of one year. Most of the rationale behind there, and I think that it was a good statement and good explanation from him, because the breakout time has two parameters. One is the detection time and one is the action time.

What would be the detection time? It depends the way the breakout is done. Whether it is in the front of the IAEA inspectors in Natanz or that the country wants to demonstrate that they are breaking out. That's the easy one, because you see very quickly. But if it is a protected diversion, done in secrecy, perhaps in a combination with a declared installation and an undeclared installation, it becomes much more difficult to detect, and at the very end the IAEA needs to have proof that this is taking place, and in the worst case, the only proof which might be there is environmental sample. It takes three months to have the results for environmental samples taken in Iran. You see it from the IAEA quarterly reports, the latest report, published last week shows that they had the results until end of July. So you really can't detect all the scenarios in one or two weeks. It will take months. So that's one parameter. And then it's the action time, probably if it's non-compliance, you need to take this case to the UN Security Council, have a consultation negotiation, etc. So in my view, three, four months in international environment is a very short short period of time. So I think that this was the rationale behind the statement of Secretary Kerry.

And then last but not the least, Iran has talked a lot about transparency. Transparency is okay, but I think that the experience from last twelve years shows to us that is that these transparency measures need to be legally binding so that the international community can act and Iran is obliged to do this and therefore this would be done through the UN Security Council resolutions. And now I am ready to take questions. Thank you.

Omri Ceren: Thanks for that Olli, and as a reminder you can email us questions as this call goes on at press@theisraelproject.org. The first question we have has to do with the gesture you made toward breakout times, and you, there were also quotes published this weekend in the *Sunday Times* where you estimated that Iran may have a few thousand - between four and five thousand, was what the article said - advanced centrifuges, IR-2M centrifuges, and this was based on assessments that you made. I was wondering if you could give us a sense for, if Iran has, indeed has, let's say 4,000 undisclosed IR-2M centrifuges, what their sneak-out time would be like if they decided to try to not so much rush across the nuclear finish line, but to sneak across with undeclared materials and with undeclared elements. So how long if they had 4,000 IR-2M's would it take them, with natural uranium, how much with 5% enriched or LEU, and how much with 20%?

Dr. Olli Heinonen: First of all, just a clarification. You know, that article in the *Sunday Times* said that they can have up to a few thousand centrifuges or they have raw materials to manufacture them. So we don't know where they are today, and that's why it's important the IAEA verifies from the very beginning the actual inventory of the centrifuges and the consumption of the material. But let's put that one aside and then go to your question of 4,000 centrifuges. These centrifuges are five times more powerful than the current IR-1s, which are, they're in Natanz. So these 4,000 centrifuges actually are altogether like the enrichment power now in Natanz with the IR-1s. But if you take, you know, 1,000 of these centrifuges and just as a kind of thumb rule, if you have 1,000 of these centrifuges and you start with natural uranium, at the end of that one year you have enough material for one nuclear device at least. If you take 2,000 of those centrifuges and natural uranium, it will be half a year. If you take 4,000 of them, it will be three months if you start from natural uranium. But if you start from the low-enriched uranium, 3-4% enriched, it becomes much shorter because you have already done much of this enrichment effort. So it will cut these times to less than half if you have, for example, 4% enriched uranium. So, then if I had 1,000 such centrifuges and I feed in low-enriched uranium, it's less than half a year. If I had 2,000 of them, it's less than three months. And if I have 4,000 of them, I start to be around

one-month timeframe. Then, if I had 20% enriched uranium, we are just talking about a couple of weeks, because once you have 20% enriched uranium, you have actually done 90% of your enrichment work. So this is the 10% effort which is remaining, so that's why the concerns are also on Iran's holding some 20% enriched uranium.

Omri Ceren: And, so that discusses, that kind of gets at what you were talking about earlier, which is the uncertainty of the program, and I was wondering how you would set up a regime, a monitoring and verification regime, or, more broadly, how you would structure a deal that, as you said a second ago, kind of foregrounded verification and kind of foregrounded this idea that the IAEA would verify things?

Dr. Olli Heinonen: First of all, IAEA needs additional authorities, you know, in order to do this properly. So this is very often called additional protocol plus, where the IAEA has legal rights, preferably authorized by the UN Security Council to go beyond and do measures like trying to establish the total inventory of centrifuges, or go to the uranium mines and find out how much really uranium has been produced and recovered there. So this is a prerequisite for anything. So the most important parameter here are actually the IAEA access rights, which need to be legally binding - no voluntary measures, no transparency during this first period of the agreement, whether it's ten years or twenty years, that remains to be discussed by those people who negotiate it. But then, to get it really running properly, since there has been this compliance problems with Iran in the past, I would put there certain kind of milestones, milestones which are then tied with the compliance by Iran. So when you would see, for example, when the IAEA has been able to establish a total number of centrifuges in Iran, that would be one of the first milestones, and then, in return, Iran will then get some of the sanctions lifted or release some of the frozen funds so that there is a kind of incentive to do it. And these milestones, they need to be clear. Some of them will take time, like when we established the total inventory of uranium in, in Iran. That one will take at least a year, so you cannot do it in a shorter period of time. So then I could very well envision that this first, first milestone is that when the agreement comes in force, there will be a complete declaration by Iran on its part, past and current nuclear program. That's the first prerequisite. And then the IAEA verification rights. Then, let's say, three months later, there's another milestone, by which time the IAEA must have been able to establish the total number of centrifuges and make sure that all those are under its control and Iran has done those dismantling operations which the agreement will require. And when that milestone has been without any ambiguity met, then there will be incentive for Iran or Iran will get something in return. And then you put those milestones there. At this point [in] time, I think also Iran must have let the IAEA see

the places related to military dimensions, visited places, Parchin, have had surface discussions with these scientists to understand what was the purpose of those experiments and how far they got, and agree by then on some kind of long-term monitoring regime. So these are examples of the milestones.

Omri Ceren: And, you know, there are other ways to structure a deal that are being put forward that don't foreground verification. I was wondering if you could speak a little bit about the scenarios you envision, and about what you think would happen if a deal was structured in a different way. Why this way rather than other ways?

Dr. Olli Heinonen: Well I think that this is the clear way. And here I look, you know, the experiences from what we have had, not only with Iran but also if you look, the agreed framework. So I think all this other proposals there, I don't see them really very useful. And putting all this unclear things to the very end, like military dimensions, will be sold at one much, much later time will keep this ambiguity there, and I think it's a very difficult to agree to a reasonable number of centrifuges. So I think that this is the most practical approach, but it has to be also kept simple, not a tremendous amount of these milestones, because this was one of the problems with the agreed framework with North Korea, that there were a lot of small milestones and then there were differences in view whether North Korea complied or whether the U.S. complied. So we should avoid that. Clear, simple - few, four, five, six milestones maximum, and not like, you know, some other ones who put 10 or 20 milestones there.

Omri Ceren: Got it. And we're winding down on time, but we have a couple of other questions about this central theme that you've been hitting, which is the uncertainty about the unknowns about Iran's nuclear program, and I was wondering how much do we know about Iran, about the way Iran researches and develops centrifuges? Does the IAEA, do they visit and inspect every site where Iran produces centrifuges? Do we know where they do the mechanical testing on, for instance, the IR-5s and the IR-8s?

Dr. Olli Heinonen: IAEA knows some of it, but, you know, I don't think that there is any certainty that this is a complete picture because this is missing IAEA access under Joint Plan of Action has been actually very limited, because this has been an invitation mainly from Iran to show the places. But there is no way that you can come to conclusion from those visits that this is all what we see. So that's why I think that one has to do, go much, much further than what is, what we have seen now, and that's the only thing I can say. And then the other problem is that actually, IAEA has not disclosed, because there is this word 'mutually agreed information' so actually don't know what IAEA has asked and we don't know what they got in return. So it's very

difficult to judge how thorough this investigation is at this point of time. But it's far from being what we called the verification of the completeness of Iran's declaration.

Omri Ceren: You gestured earlier to a proposal that's floating around right now that would allow the Iranians to avoid having to downgrade their reactor at Arak. It goes, in the foreign policy community it's referred to as the Princeton Proposal. I was wondering if you could circle back to that. We got two questions about it. This is Iran's plutonium track. What is the proposal and to what degree would it prevent the Iranians from exploiting a plutonium track to a bomb?

Dr. Olli Heinonen: You know, the modification as such is okay. You know, it produces much less plutonium than the Arak heavy water reactor would produce. But unfortunately, it's not irreversible. So one thing – it's set up, it's set up in such a way that it's, I don't say overly easy, but not overly difficult also, to turn the reactor back to a heavy water reactor. And it doesn't include any shipment of heavy water out from the country, heavy water which is not any more needed. So therefore, I think that from a technical point of view, the better solution would be a real modification of the reactor core in such a way that it only can operate as a light water reactor, like practically all the research reactors in the world are today. So, you know, whether you go to this one which Jordan is buying or, you know, South Korea, Japan - none of them have this kind of reactor. They all have light water reactor with fuel enriched up to 20%.

Omri Ceren: Mhm, and the, I think the last question that we're going to have time for today involves something that's happened since Friday really, a discussion that's been happening in town. On Friday, the IAEA released, or the IAEA's quarterly report leaked, and it indicated that Iran continued to deny the agency access that it needed to verify that the Iranian program was peaceful. And there has been a wealth of questions since then. Now, the JPA seems to imply that unresolved IAEA issues would be resolved by Iran and the P5+1 directly, and now there are voices of concern that says, that are worrying that those issues won't be resolved before a deal is inked. I was wondering if you could speak to whether or not a deal could be sufficiently robust in the absence of IAEA verification, and given that we're so close to the deadline for talks and these questions remain unresolved, what has to happen at the beginning of an agreement to fix all of the things that should have been resolved before the agreement?

Dr. Olli Heinonen: First of all, let's make it clear. The only authority which can verify the compliance on comprehensive safeguards agreement pursuant to the Non-Proliferation Treaty is the IAEA. P5+1 has no authority to that end. They can do whatever they want together with Iran, that's fine. But at the very end, IAEA has to be

satisfied with its verification requirements. So IAEA cannot delegate this one to anyone else. This we need to keep in mind. So therefore, I think that people sometimes little bit misinterpret this [inaudible] P5+1 can do certain arrangements and then IAEA has to be satisfied. That's wrong. And then we have to keep also in mind that there's a little, much more at stake than just, you know, Iran-IAEA relations. First of all, there are Security Council resolutions which have asked Iran to suspend its reprocessing, enrichment, and heavy-water reactor programs. Stop also ballistic missile program, which is not discussed at all. And these are Security Council resolutions which are under international law binding, so now if the country doesn't follow and meet those obligations, this sets a very bad precedent for future proliferators. And in particular, I think that everyone's mind is what will happen next in the Middle East and what will happen, for example, in Northeast Asia and in case of North Korea. And the second thing is that there are good things here, but there are bad things. The good thing is that we get the solution here. But the bad thing is that there is a country which is in non-compliance with its safeguards undertaking and it is allowed to continue uranium enrichment before it has really proved that it has adhered to the agreements. So this is a very bad precedent and undermines I think the authority of the non-proliferation regime and the authority of the United Nations Security Council.

Omri Ceren: OK, on that note, we are at 30 minutes on the dot. Thank you everybody for dialing in. Thank you again, Dr. Heinonen, for the time today. If anybody on the call has something that they want to follow up on, you can always reach us at press@theisraelproject.org, press@theisraelproject.org, and thank you everybody.

Dr. Olli Heinonen: Thank you.