Center for American Progress

40x35: A Zero-Carbon Energy Target for the World's Largest Economies

Andrew Light, Mari Hernandez, and Adam James March 7, 2013

In the past several years, small groups of some of the world's largest carbon polluters have joined forces to reduce their greenhouse gas emissions as part of their overall efforts to slow the pace of dangerous global warming. These efforts include the G20 leaders' 2009 pledge to phase out fossil-fuel subsidies;[1] the launch of a number of efforts on clean energy cooperation through the global Clean Energy Ministerial starting in 2010;[2] and the creation of the Climate and Clean Air Coalition to Reduce Short-Lived Climate Pollutants a year ago, which started with six nations and has now grown to 27 countries plus the European Union.[3]

Following on these efforts, we propose that the 17 parties in the Major Economies Forum, the U.S.-led coalition of the world's largest carbon emitters,[4] set a target of generating 40 percent of their electricity from zero-carbon sources by 2035—what we call the "40x35" target.

Our analysis shows that meeting this target is not only highly feasible but, if met, would also reduce these countries' cumulative CO2 emissions by approximately 6.4 gigatons—6,398 million metric tons—by 2035. While there are other kinds of renewable energy targets that would result in greater emissions reductions—for example, targets that exclude hydroelectricity or nuclear power—we argue that the 40 percent all-inclusive zero-carbon target is more politically feasible and also sufficiently ambitious to be worth pursuing. Achieving this target would be a significant contribution to meeting the global goal of the international climate negotiations of stabilizing temperature increases caused by climate change at 2 degrees Celsius over preindustrial levels by the end of this century.[5]

As we will show, projections for a zero-carbon electricity mix for many of the parties of the Major Economies Forum by 2035 are already quite high—some nations are already headed beyond the 40 percent target on a business-as-usual pathway. So far, however, none of these countries has made a documented commitment for achieving any energy goals beyond 2030.

The existence of a set target among the Major Economies Forum parties would help protect projected emissions reductions from backsliding due to changes in fuel costs,

currently unforeseen policy changes in these countries as governments change, and other unanticipated consequences. A common target by these developed and developing countries could galvanize the range of national-level policies already in place, and increase the ambition of all parties to hit the target. More importantly, these countries could make a common commitment along with an agreement to share best practices to expand the renewable electricity sector, cooperate on technology development and deployment, and strengthen existing bilateral agreements between parties that support these ends.

We will also demonstrate that pairing such a zero-carbon electricity target with an energy efficiency goal would be incredibly beneficial. First, incorporating energy efficiency from the beginning in countries that are likely to see a surge in electricity demand over the coming years will create more sustainable smart energy systems in those countries. Second, reducing total energy demand means that each investment in new, zero-carbon generation counts for more in terms of total emissions reductions. Demand reduction will enable many countries to more easily hit this zero-carbon target.

In this issue brief we present the rationale for pursuing emissions reductions through the Major Economies Forum, our analysis on a range of target scenarios as applied to the forum parties, and our recommendation for action.

An action agenda for the Major Economies Forum

While the Major Economies Forum's roots go back to the Bush administration's "Major Economies Meetings,"[6] the Obama administration launched the forum in 2009 as a place for cooperation among the world's 17 largest greenhouse gas polluters: Australia, Brazil, Canada, China, the European Union, France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, South Africa, South Korea, the United Kingdom, and the United States.[7]

Unlike the U.N. Framework Convention on Climate Change, or UNFCCC, the Major Economies Forum is not formally constructed as a treaty-making body but is nonetheless a leadership-level convening process that can pursue opportunities for mutual cooperation among its members. While the larger U.N. climate process includes 194 parties, the 17 members of the Major Economies Forum represent approximately 80 percent of all global greenhouse gas emissions.[8] At its inception, the hope was that the Major Economies Forum could provide an opportunity for frank dialogue between member countries about achieving emissions reductions.

While many of its meetings have served more as a place for advanced debate in a smaller forum for each year's U.N. climate negotiations, the Major Economies Forum has made some progress on its own. During its July 2009 meeting in L'Aquila, Italy, President Barack Obama famously embraced the goal taken up by the G8 that developed countries should aim to reduce their carbon emissions by 80 percent below 2005 levels by 2050 as a fair share of their global mitigation obligations.[9]

Early on, various groups of countries in the forum also developed "Technology Action Plans," which detailed proposals to accelerate progress in specific sectors of clean energy technology.[10] Development of these plans in turn led to the creation of the Clean Energy Ministerial meetings—the fourth of which will take place in New Delhi in April—bringing together the energy ministers from Major Economies Forum parties for collaboration in a number of key sectors, including advanced vehicles, wind, solar, and carbon capture and storage.[11]

U.S. Special Envoy for Climate Change Todd Stern announced in January that the Obama administration is ready for a more direct "action agenda" for the Major Economies Forum.[12] The timing is ripe for movement in this body, given where we are in the larger international climate negotiations.

In 2011 the U.N. Framework Convention on Climate Change began a process to create a new global climate agreement under the auspices of the "Durban Platform"—a new negotiating track specifically designed to create a new binding global climate treaty to cover mitigation and adaptation that would be applicable to all parties—to be finalized in 2015 but not to take effect until 2020 at the earliest.[13] The good news is that this new agreement will presumably include some level of greenhouse gas cuts for the biggest developed and developing countries—unlike the Kyoto Protocol, which only required reductions from the developed countries that ratified the treaty.[14]

The bad news is that since this new treaty won't go into effect until 2020, it will not address what is now recognized as the critical "ambition gap"—the gap between the level that most countries in the world have already committed to cut their emissions to by 2020 and the cuts needed to stay on a pathway in which we could still feasibly stabilize human-caused global temperature increase at 2 degrees Celsius by the end of the century. Overcoming this gap may require doubling current unilateral global commitments from all countries that have publicly pledged what they are willing to do to lower their emissions by 2020.[15] While the Durban Platform also includes a workstream addressing the ambition gap, the submissions to date have not been very helpful, and we have low expectations that it will actually achieve any meaningful outcome in time to address this gap, given the fractious politics of the U.N. process.[16]

While the U.N. climate talks are effectively locked up in a process of creating a new post-2020 treaty, the need for additional international cooperation outside of these negotiations is essential. Even if the parties in the U.N. Framework Convention on Climate Change agreed to a bold, highly ambitious, and legally stringent global treaty for emissions reductions by 2015, this new treaty may arrive only in time to govern a world condemned to temperature increases at 4 degrees Celsius or more by 2100—and the disastrous consequences which would result—unless more ambitious measures are undertaken to reduce emissions through this decade.[17]

The advantages of the Major Economies Forum, particularly in the context of climate action, are relatively straightforward. This smaller, high-level working group is more nimble and unhindered by the bureaucratic processes that can sometimes derail the larger U.N. climate talks. Additionally, since the forum's member countries collectively represent 80 percent of global carbon emissions, decisions made in the forum can be incredibly transformative in a relatively short period of time. Just as importantly, using the Major Economies Forum for achieving targets such as the ones we describe below does not threaten the integrity or authority of the U.N. process. While a comprehensive global agreement on emissions cuts, adaptation, finance, and technology sharing is essential, more discrete targets among the major climate polluters that do not place a limit on future ambition can be essential for progress while a new global agreement is in process.

Action by the Major Economies Forum also answers one of the common new responses among those previously opposed to climate action. During the last election season, Republican presidential candidate and former Massachusetts Gov. Mitt Romney remarked that unilateral action by the United States to reduce its carbon emissions was futile. "The reality is that the problem is called global warming," he said, "not America warming."[18] More recently, in response to President Obama's prominent exhortation for action on climate change in his second Inaugural Address, Sen. Chuck Grassley (R-IA) remarked that, given the global nature of the problem, "We ought to be working on an international treaty as opposed to individual legislation for the United States."[19] While we strongly disagree that there is no point to action at home on reducing our carbon emissions, both Gov. Romney and Sen. Grassley are correct in saying that coordinated international action is needed—or else the gains from our domestic efforts in terms of creating new jobs or promoting energy independence will be swamped by the impacts of destructive climate change.

Scenarios for renewable energy targets in the Major Economies Forum

The Major Economies Forum offers a unique opportunity to substantially reduce carbon dioxide emissions through adopting a common zero-carbon target among participating countries. In this analysis, we examine the outcome and feasibility of either a 35 percent or 40 percent zero-carbon electricity standard by 2035 for all of the forum's parties under four different scenarios. These include options for including hydroelectricity, nuclear power, and renewables under the target, or only subsets of the three. This covers the spectrum of zero-carbon generation—from renewable sources such as solar, wind, and hydropower, to no-carbon sources such as nuclear energy.

We analyzed four scenarios to determine both the resulting ambition gaps for each party in the Major Economies Forum to meet a desired target and the total carbon dioxide emissions reductions if all parties embraced and achieved the target:[20]

- **Scenario 1:** 35 percent renewable electricity target by 2035, excluding both hydroelectricity and nuclear power
- **Scenario 2:** 35 percent renewable electricity target by 2035, including hydroelectricity but not nuclear power
- **Scenario 3:** 35 percent zero-carbon target by 2035, including both hydroelectricity and nuclear power
- **Scenario 4:** 40 percent zero-carbon target by 2035, including both hydroelectricity and nuclear power

Tables 5–8 in the appendix show the projected 2035 business-as-usual zero-carbon electricity generation for each of the forum's parties, which we were able to analyze with currently available data; the additional zero-carbon generation—in terawatt hours and as a percentage of total supply—needed to meet each target; and the emissions reductions resulting from the target under each scenario. It is important to note that while South Africa and Indonesia often appear to be the furthest away from the target in each of these scenarios, that is in part a result of the limitations of our data. These countries were the only two where we were unable to directly use data from the International Energy Agency's most recent World Energy Outlook report or to infer the outcome for a party based on a larger dataset included in that report. (Our methodology for generating figures for these two parties is explained in the appendix.)

The outcomes of each scenario are further discussed below.

Scenario 1

Because of limitations on data accessibility and availability—explained in the appendix—we reduced the 17 parties of the Major Economies Forum to 11 for the purposes of our analysis over all four scenarios. The 35 percent renewable electricity target by 2035, excluding both hydroelectricity and nuclear power, is the only scenario in which all 11 parties must go beyond their business-as-usual projections to meet the target. As a result, Scenario 1 yields the highest cumulative CO2 emissions reductions, including business-as-usual reductions and reductions achieved because of the target, of the four scenarios, at approximately 8.1 gigatons—8,087 million metric tons—by 2035. The CO2 emissions reductions that result solely from the target and not including business-as-usual reductions would be about 6 gigatons—5,951 million metric tons—which would represent 30 percent of projected global CO2 emissions in 2035.

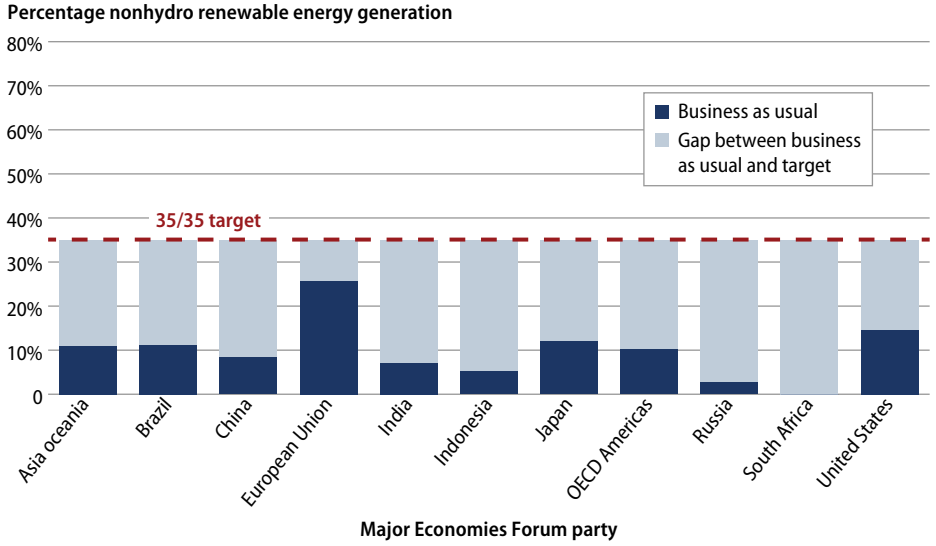
TABLE 1

CO2 emissions reductions by 2035

Scenario 1	2035 additional CO2 emissions reductions (in million metric tons) from target	2035 total cumulative emissions reductions from target and BAU (in million metric tons)	2035 additional emissions reductions as a percent of total global 2035 CO2 emissions
	5,951	8,087	30%

FIGURE 1

Additional percentage of nonhydro renewable generation to meet 35 percent target by 2035



Note: N-H = nonhydro; RE = renewable energy; Gen = generation; BAU = business as usual; MEF = Major Economies Forum

* The following Major Economies Forum countries' data are captured under the regions specified: Australia (Asia Oceania), France (European Union), Germany (European Union), Italy (European Union), South Korea (Asia Oceania), Mexico (OECD Americas) and the United Kingdom (European Union). Due to the lack of country-level data for certain Major Economies Forum countries from the International Energy Agency, we used 2030 projections for Indonesia and South Africa, and we were unable to exclude three non-Major Economies Forum countries: Chile, Israel, and New Zealand. In this analysis, Asia Oceania excludes Japan and OECD Americas excludes the United States.

Sources: International Energy Agency (World Energy Outlook 2012); The Institute of Energy Economics-Japan, The ASEAN Centre for Energy and The National ESSPA Project Teams (The 3rd ASEAN Energy Outlook); and the South Africa Department of Energy (Integrated Resource Plan for Electricity 2010–2030).

Scenario 2

The 35 percent renewable electricity target by 2035, including hydroelectricity but not nuclear power, both reduces the ambition gap for each of the Major Economies Forum parties and would allow three parties to meet the target based on their projected business-as-usual generation mix: Brazil, the European Union, and the Organisation for Economic Co-operation and Development, or OECD, Americas—excluding the United States, which means Canada and Mexico—though given Canada's expansive hydroelectricity resources, it is more likely to hit the target than Mexico. With 8 of the 11 parties increasing their zero-carbon generation by 2035, the total cumulative CO2 emissions reductions would equal approximately 6.6 gigatons—6,555 million metric tons. The CO2 emissions reductions resulting solely from the target would be 3.5 gigatons—3,474 million metric tons—or 17 percent of projected global CO2 emissions in 2035.

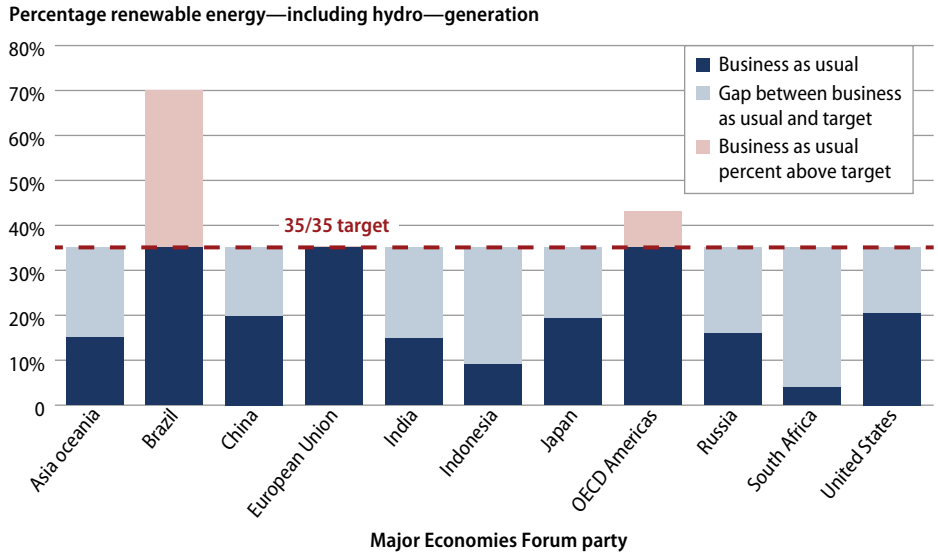
TABLE 2

CO2 emissions reductions by 2035

	2035 additional CO2 emissions reductions (in million metric tons) from target	2035 total cumulative emissions reductions from target and BAU (in million metric tons)	2035 additional emissions reductions as a percent of total global 2035 CO2 emissions
Scenario 2	3,474	6,555	17%

FIGURE 2

Additional percentage of renewable—including hydro—generation to meet 35 percent target by 2035



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Scenario 3

The 35 percent zero-carbon target by 2035, including both hydroelectricity and nuclear power, is the most easily attainable target since it would require the lowest amount of additional zero-carbon generation overall out of the four scenarios. In this scenario, six Major Economies Forum parties—OECD Asia Oceania, Brazil, the European Union, Japan, OECD Americas (Canada and Mexico), and the United States—are able to meet or exceed the target. China and Russia would have to increase their zero-carbon generation target by less than 10 percent. Just three parties—India, Indonesia, and South Africa—would have to increase their zero-carbon generation more than 15 percent over projected business as usual. The total cumulative CO2 emissions reductions resulting from Scenario 3 would be 5.5 gigatons—5,487 million metric tons. The CO2 emissions reductions from just the target would be approximately 1.5 gigatons—1,463 million metric tons—representing 7 percent of projected global CO2 emissions in 2035.

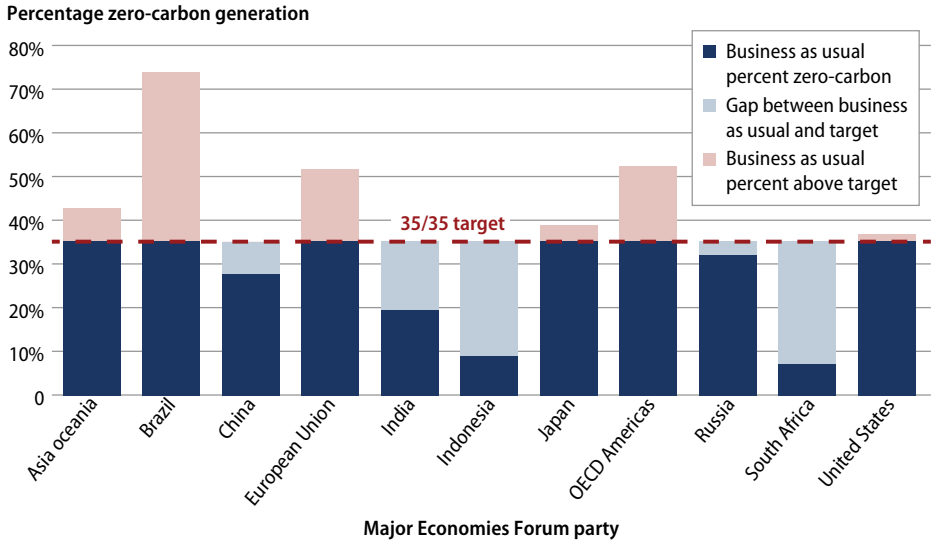
TABLE 3

CO2 emissions reductions by 2035

	2035 additional CO2 emissions reductions (in million metric tons) from target	2035 total cumulative emissions reductions from target and BAU (in million metric tons)	2035 additional emissions reductions as a percent of total global 2035 CO2 emissions
Scenario 3	1,463	5,487	7%

FIGURE 3

Additional percentage of zero-carbon generation—Including hydro and nuclear—to meet 35 percent target by 2035



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Scenario 4

Scenario 4 increases the target to 40 percent zero-carbon electricity, including both hydroelectricity and nuclear power, by 2035—the 40x35 target. Under this scenario, four Major Economies Forum parties—OECD Asia Oceania, Brazil, the European Union, and OECD Americas (Canada and Mexico)—will meet or exceed the 40x35 target. The other seven countries—China, India, Indonesia, Japan, Russia, South Africa, and the United States—will need to increase their zero-carbon electricity generation to meet the target. Under Scenario 4, total cumulative CO2 emissions reductions would equal about 6.4 gigatons—6,398 million metric tons—by 2035. The CO2 emissions reductions resulting from the 40x35 target would be 2.4 gigatons—2,374 million metric tons—which would represent about 12 percent of projected global CO2 emissions in 2035.

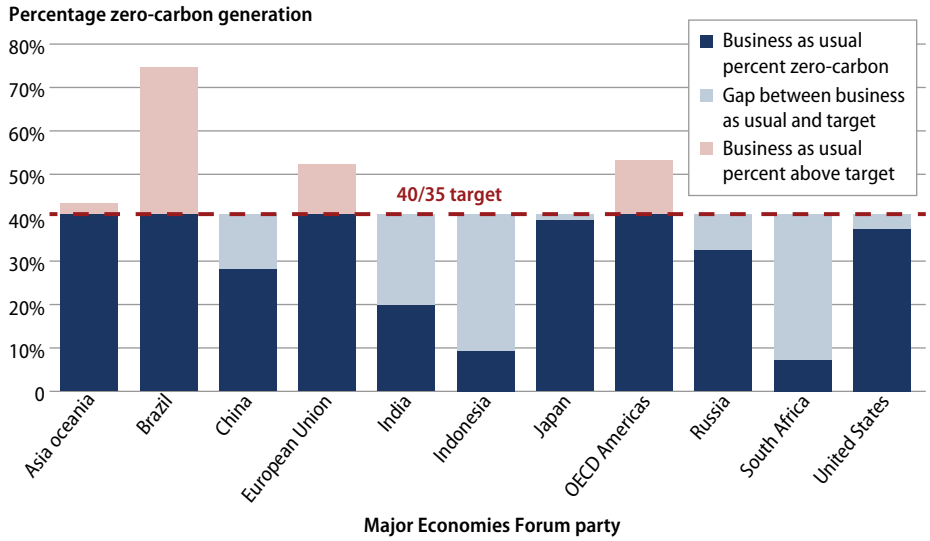
TABLE 4

CO2 emissions reductions by 2035

	2035 additional CO2 emissions reductions (in million metric tons) from target	2035 total cumulative emissions reductions from target and BAU (in million metric tons)	2035 additional emissions reductions as a percent of total global 2035 CO2 emissions
Scenario 4	2,374	6,398	12%

FIGURE 4

Additional percentage of zero-carbon generation—including hydro and nuclear—to meet 40 percent target by 2035, by MEF party



Note: N-H = nonhydro; RE = renewable energy; Gen = generation; BAU = business as usual; MEF = Major Economies Forum

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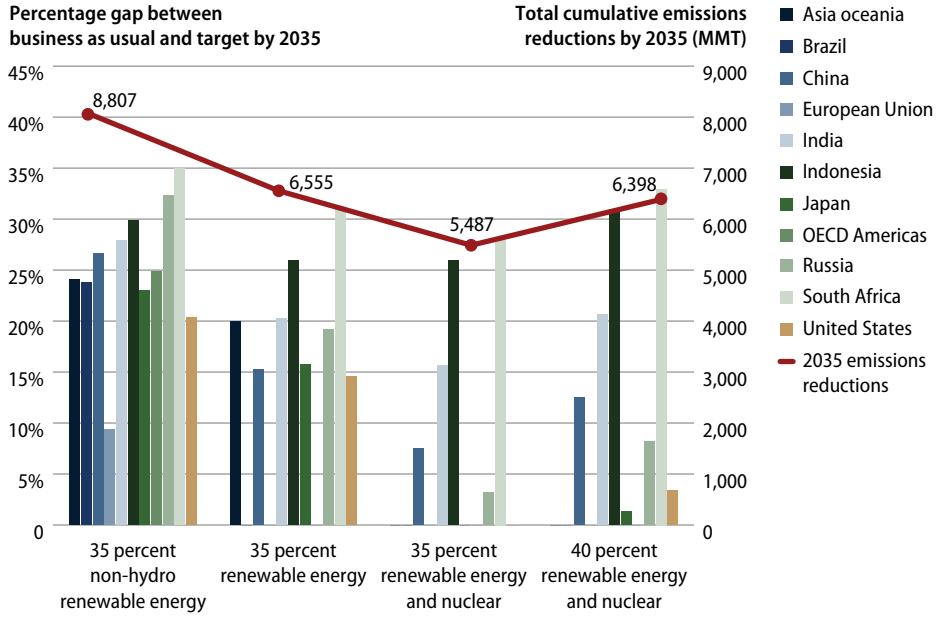
Comparing the scenarios

To ascertain the most politically viable and highest-impact scenario, we performed a comparative analysis of the varying ambition needed by different countries to hit different fuel-mix targets by 2035. Figure 5 shows the necessary percent increase in zero-carbon electricity generation by target and country, and the total cumulative emissions reductions resulting from each scenario.

FIGURE 5

Major Economies Forum party ambition gap and total cumulative emissions reductions by scenario



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This chart illustrates the varying ambition gaps by each of the forum's parties, as we have broken them out, under each scenario. As the chart shows, Scenario 1 would require each party to increase its nonhydroelectricity non-nuclear zero-carbon electricity generation. Compare this with Scenario 2 and Scenario 3, wherein adding first hydroelectricity and then nuclear power as well to the target would decrease the amount of zero-carbon generation needed to meet each target. In other words, it is easier for all countries to hit targets that include nuclear power and hydroelectricity, as opposed to just renewables. Finally, in Scenario 4, where the overall target goes up to 40 percent, the ambition gaps for the five parties included in Scenario 3 increase, and two other parties must add zero-carbon generation to meet the new target.

TABLE 5

Feasibility of meeting scenario targets

	Scenario 1: 35 percent N-H RE by 2035	Scenario 2: 35 percent RE by 2035	Scenario 3: 35 percent RE plus nuclear by 2035	Scenario 4: 40 percent RE plus nuclear by 2035
MEF country or region*	N-H RE Gen percent gap between BAU and target by 2035	RE gen percent gap between BAU and target by 2035	RE plus nuclear gen percent gap between BAU and target by 2035	RE plus nuclear gen percent gap between BAU and target by 2035
Asia Oceania	24%	20%	0%	0%
Brazil	24%	0%	0%	0%
China	27%	15%	7%	12%
European Union	9%	0%	0%	0%
India	28%	20%	16%	21%
Indonesia	30%	26%	26%	31%
Japan	23%	16%	0%	1%
OECD Americas	25%	0%	0%	0%
Russia	32%	19%	3%	8%
South Africa	35%	31%	28%	33%
United States	20%	15%	0%	3%

Note: N-H = nonhydro; RE = renewable energy; Gen = generation; BAU = business as usual; MEF = Major Economies Forum

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Sources: International Energy Agency (World Energy Outlook 2012); The Institute of Energy Economics-Japan, The ASEAN Centre for Energy and The National ESSPA Project Teams (The 3rd ASEAN Energy Outlook); and the South Africa Department of Energy (Integrated Resource Plan for Electricity 2010–2030).

To help interpret these data, Table 5 shows the feasibility of a given country's ability to hit the range of targets using color coding:

- The green color represents a country that needs a 0 percent to 15 percent increase in zero-carbon electricity generation over business-as-usual projections.
- The yellow color represents a country that needs a 16 percent to 25 percent increase over business-as-usual projections.
- The red color represents a country that needs a 26 percent to 35 percent increase over business-as-usual projections.

A glance at the four columns reveals that Scenario 3 and Scenario 4 are the easiest to hit under current business-as-usual projections. Additionally, there is little difference between the countries that would have difficulty hitting the Scenario 3 target and the Scenario 4 target, though the percent increase needed in each case to achieve this goal is important for reasons we will discuss below.

40 percent zero-carbon electricity generation by 2035

We recommend that the parties of the Major Economies Forum adopt a target of 40 percent zero-carbon electricity generation by 2035, which includes both hydroelectricity and nuclear power. The 40x35 target would reduce global CO2 emissions an additional 12 percent over projected 2035 levels, bringing cumulative CO2 emissions down by 6.4 gigatons by 2035.

Our analysis shows that all developed countries in the Major Economies Forum should be able to hit the 35 percent zero-carbon target, including both hydroelectricity and nuclear power, by 2035—as indicated by Scenario 3. The downside to Scenario 3 is that it might appear to put too much of the burden on developing countries to achieve the target because of their lower starting point. If the target is raised to 40 percent, however, then the total reductions go up, and the playing field levels since the United States and Japan still have to increase their ambition—they are at 36.7 percent and 38.7 percent, respectively—along with China, India, Indonesia, Russia, and South Africa—and potentially Mexico, depending on how they disaggregate from Canada in a more specified analysis. All of these factors would make the 40x35 target more politically viable as a form of international cooperation, even if it raises the bar of agreeing to the target within each country. It might be possible, though, to allow more time for some parties to hit the target or adopt slightly variable targets based on current business-as-usual projections or other criteria.

Additionally, it is likely the case that the United Kingdom and Italy would also have to increase their ambition once they are disaggregated from the European Union, given their limited nuclear resources compared to France. More importantly, increasing the target from 35 percent to 40 percent zero-carbon electricity generation adds nearly one gigaton of CO2 emissions reductions to the cumulative total by 2035.

In addition to Scenario 4 being more attractive when compared to the other three scenarios due to greater ambition sharing and overall carbon reductions, the 40x35 target would help lock in any business-as-usual emissions reductions that are not currently backed by national targets or goals. The final emissions reductions modeled in our study, which help justify adoption of the target, include both business-as-usual emissions reductions from 2010 forward and the added reductions from an increase in ambition for those parties that are not expected to meet the stipulated target in each scenario. Because business-as-usual projections for future deployment of renewables and nuclear power for each of the Major Economies Forum's parties do not represent current policy commitments—since no party has yet to adopt this target—a target and commitment in the forum would help ensure that currently projected emissions reductions are realized and would also hedge against backsliding in the case of declining fossil-fuel prices, priority changes at the national level following elections, and other unanticipated factors.

Additionally, the wide range of policies already in place at the national level is both encouraging and problematic. The good news is that 14 Major Economies Forum countries—15, if you count state renewable portfolio standards in the United States—already have some form of renewable energy or electricity targets in place.[21] These targets may vary in scope and ambition by country, but our assessment is that they would be crucial stepping stones to reaching a more ambitious 40x35 target. The added value of a 40x35 target in the Major Economies Forum is that it would aggregate and galvanize this patchwork of country-level and subnational policies, much in the same way that a national clean energy standard in the United States would tie together existing state renewable portfolio standards and would encourage states without a standard to increase their ambition and cooperate on best practices with states that are further along.[22]

This potential to create an overarching target among the major economies would likely have significant economic implications. Best practices and potential cooperation on the development and deployment of clean energy technologies could spur new bilateral and multilateral agreements and, in places such as the European Union and Australia that have launched carbon markets—which set a tradable limit on greenhouse gas emissions in different sectors—may encourage the creation of a more resilient electric grid that allows for the more efficient delivery of renewable electricity from sources to end-users or advance the effectiveness of carbon-trading mechanisms.

Although we did not analyze an efficiency target in this study, we recognize that the inclusion of an efficiency target in the 40x35 scenario could significantly increase by several orders of magnitude the emissions reductions achieved by such a program for decreasing power demand. Recent modeling by the U.S. National Renewable Energy Laboratory shows a large potential increase in cumulative emissions reductions in the United States if an efficiency target is added to a 25 percent by 2025 renewable electricity standard.[23] Because most of the increase in electricity demand out to 2035 is from developing countries—60 percent from China, India, and the Middle East—increasing energy efficiency in the building sector, which accounts for one-third of global energy consumption, could drastically reduce demand by incorporating energy savings to new construction projects and could therefore reduce the need to build new fossil-fuel generation.[24] As such, the parties of the Major Economies Forum should strongly consider pairing a zero-carbon generation target with an energy efficiency target if they take up a proposal of this type.

Alternatively, individual countries should consider adopting a complementary energy efficiency target as a means to maximize the role that zero-carbon generation will play in meeting the Major Economies Forum target. To illustrate this, consider that one gigawatt of new zero-carbon generation counts for less when demand is higher, and more—in terms of total percentage—when demand is lower. Particularly in the developing countries that will be building new generation to meet demand, this kind of target would increase the bang for the buck on each investment in zero-carbon resources.

Next steps for the United States

If the Major Economies Forum parties adopt the 40x35 target, then the United States will have to increase its zero-carbon electricity generation by 3 percent, or about 182 billion kilowatt hours, over business-as-usual projections. Although a 40x35 federal clean energy standard in the United States would ensure that the new Major Economies Forum target would be met, the political feasibility of this in the near term is very low. The adoption of a clean energy standard that designates a target for renewable energy development on public lands could also increase clean energy generation in the United States.[25] In lieu of an overarching national policy, the United States could continue to pursue greater renewable energy development through various departmental policies and programs. The U.S. Army, for example, plans to deploy one gigawatt of renewable energy by 2025.[26]

At the state level, policymakers could adopt or strengthen renewable energy standards in order to increase zero-carbon electricity generation and reach the 40x35 target. Renewable energy standards are regulatory mandates that set specific targets requiring utilities to generate a certain percentage of electricity from clean energy sources. Currently, 29 states plus the District of Columbia have these standards.[27] State policymakers should focus on strengthening current renewable energy standards and adopting new targets in states without a clean energy policy.

Conclusion

While the U.N. climate process works through the difficult task of creating a new comprehensive climate treaty by 2015—and then works five more years to ratify it by 2020—the people of the world are growing more and more impatient. Yet there is little that can be done, if anything, to speed this process along. Development of any new treaty is a long and cumbersome process fraught with derailments—especially when close to 200 parties are involved.

In the meantime, we need more action. We need to take on the ambition gap between what the parties who have been willing to articulate their 2020 targets have said they will do and what is needed to make it possible to achieve some modicum of climate safety in the future.

Our duties here are clear. As President Obama put it in his most recent State of the Union address, "For the sake of our children and our future, we must do more to combat climate change."[28] More aggressive steps forward on an action agenda for the Major Economies Forum is movement in the right direction. It is certainly not the only thing we need to do, nor is it sufficient to close the ambition gap we currently face, but it is achievable and, at this point, necessary.

Andrew Light is a Senior Fellow at the Center for American Progress. Mari Hernandez is a Research Associate at the Center. Adam James is a Research Assistant at the Center.

Appendix

Methodology

Although all 17 parties of the Major Economies Forum are represented in some form in our analysis, our model includes country- or region-specific data for just 11 parties—eight countries (Brazil, China, India, Indonesia, Japan, Russia, South Africa, and the United States), the European Union, and two regional groups (OECD Asia Oceania and OECD Americas)—due to the organization of currently available datasets from the International Energy Agency, or IEA.[29] The European Union, OECD Asia Oceania, and OECD Americas capture data for the eight countries—Australia, Canada, France, Germany, Italy, Mexico, South Korea, and the United Kingdom—that are not broken out individually in our model. Further individual assessments will be needed in some cases, though, especially for individual European Union member countries that take part in the Major Economies Forum and are included here in a much larger set of parties such as the United Kingdom and Italy. Additionally, due to the lack of country-level data for certain forum and nonforum countries available from the International Energy Agency, we used 2030 projections for Indonesia and South Africa, and we were unable to exclude three nonforum countries: Chile (included in OECD Americas), Israel, and New Zealand (both included in OECD Asia Oceania).

To develop this proposal, the Center for American Progress calculated the emissions reductions using the following steps:

1. Calculate emissions per terawatt hour, or TWh, by taking projected 2035 emissions from power generation and dividing by projected 2035 fossil-fuel electricity generation.
2. Calculate additional zero-carbon generation needed to reach target and multiply that additional generation for each country or region by the emissions factor calculated in the first step.
3. Calculate business-as-usual emissions reductions by subtracting 2010 zero-carbon generation from 2035 zero carbon generation and then multiplying that by each emissions factor.
4. Add business-as-usual emissions reductions to reductions from target to get total cumulative emissions reductions in 2035.

Other than data for Indonesia and South Africa, all country and regional electricity generation and CO2 emissions data are from the International Energy Agency's World Energy Outlook 2012 report.[30] The 2035 numbers are included under IEA's tables in the annexes under each country's—or region's—table under "Current Policies Scenario," so they reflect business-as-usual projections and account for growth in electricity demand. Note that the IEA's World Energy Outlook 2012 report does not provide country-level electricity or emissions data for every Major Economies Forum country, so the follow-

ing countries' data are captured under the regions specified: Australia (Asia Oceania), France (European Union), Germany (European Union), Italy (European Union), Mexico (OECD Americas), South Korea (Asia Oceania), and the United Kingdom (European Union). Additionally, we used 2030 projections for Indonesia and South Africa due to the lack of country-specific data for these countries out to 2035, and we were unable to exclude three nonforum countries' data from regional International Energy Agency datasets that we used in our model: Chile, Israel, and New Zealand. In this analysis, Asia Oceania excludes Japan, and OECD Americas excludes the United States.

Indonesia's generation and emissions data are projected for 2030 and found in "The 3rd ASEAN Energy Outlook" report released by The Institute of Energy Economics—Japan, The ASEAN Centre for Energy, and The National ESSPA Project Teams in February 2011.[31] Indonesia's emissions total for 2030—406 million metric tons, or MMT—was provided for total energy consumption rather than just electricity generation. To get the 2030 emissions total for just power generation, we calculated power generation input as a percentage of total energy consumption from fossil fuels—166.7 million tonnes of oil equivalent (MTOE)/489.2 MTOE = 34 percent. We then multiplied 34 percent by total emissions from energy consumption—406 MMT * 0.34 = 138.04 MMT—to get an estimate of 2030 total emissions from Indonesia's power-generation sector.

South Africa's generation and emissions data are projected for 2030 and found in the "Integrated Resource Plan for Electricity 2010–2030" report published by South Africa's Department of Energy in May 2011.[32] Total projected electricity generation and emissions for 2030 were included in the report, but in order to get the projected total power generation from zero-carbon generation sources in 2030, we used a percentage breakdown in the report (found on page 27) that lists projected 2030 hydroelectricity—4 percent—and nuclear power—3 percent—generation under the business-as-usual base case.

2010 generation data for Indonesia and South Africa come from the U.S. Energy Information Administration's International Energy Statistics.[33]

Assumptions

Each scenario calculates emissions reductions based on the displacement of fossil-fuel sources only and does not account for the displacement of nuclear power, hydroelectricity, or nonhydroelectricity renewable energy sources. Additionally, the emissions factor for each Major Economies Forum party is based on the average emissions per terawatt hour from all fossil-fuel sources, including coal, oil, and natural gas sources.

TABLE 6

Scenario 1: 35 percent non-hydro, non-nuclear renewable energy electricity generation by 2035 target

MEF country or region*	2035 BAU N-H RE Gen (TWh)	35/35 N-H RE target (TWh)	Additional N-H RE Gen needed to meet target (TWh)	N-H RE Gen % increase share of overall Gen to reach target	2035 additional emissions reductions (MMT) from target	Total cumulative emissions reductions (target and BAU) in MMT
Asia Oceania	126	404.6	278.6	24%	183.36	253.12
Brazil	118	369.6	251.6	24%	111.92	149.73
China	960	4033.05	3073.05	27%	2718.68	3517.55
European Union	1053	1437.1	384.1	9%	228.34	663.51
India	254	1247.75	993.75	28%	884.83	1091.40
Indonesia	40	274.015	234.015	30%	45.36	51.37
Japan	157	457.1	300.1	23%	166.35	234.53
OECD Americas	151	522.2	371.2	25%	192.11	254.21
Russia	46	592.55	546.55	32%	521.00	561.03
South Africa	0	158.9	158.9	35%	143.46	143.46
United States	795	1902.25	1107.25	20%	755.43	1166.82
Total	**3700**	**11399.115**	**7699.115**	**24%**	**5950.83**	**8086.74**

TABLE 7

Scenario 2: 35 percent renewable energy (Including hydro), non-nuclear electricity generation by 2035 target

MEF country or region*	2035 BAU RE Gen (TWh)	35/35 RE target (TWh)	Add'l RE Gen needed to meet target (TWh)	RE Gen % increase share of overall Gen to reach target	2035 additional emissions reductions (MMT) from target	Total cumulative emissions reductions (target and BAU) in MMT
Asia Oceania	174	404.6	230.6	20%	151.77	226.13
Brazil	739	369.6	0	0%	0	134.79
China	2280	4033.05	1753.05	15%	1550.90	2878.81
European Union	1447	1437.1	0	0%	0	451.81
India	526	1247.75	721.75	20%	642.64	989.90
Indonesia	71	274.015	203.015	26%	39.35	47.88
Japan	252	457.1	205.1	16%	113.69	189.07
OECD Americas	644	522.2	0	0%	0	104.54
Russia	268	592.55	324.55	19%	309.38	402.79
South Africa	18	158.9	140.9	31%	127.21	141.66
United States	1112	1902.25	790.25	15%	539.15	988.07
Total	**7531**	**11399.115**	**4369.215**	**12%**	**3474.09**	**6555.46**

TABLE 8

Scenario 3: 35 percent renewable energy (including hydro) and nuclear electricity generation by 2035 target

MEF country or region*	2035 BAU RE plus nuclear Gen (TWh)	35/35 RE plus nuclear target (TWh)	Additional RE plus nuclear Gen needed to meet target (TWh)	RE plus nuclear Gen percent increase share of overall Gen to reach target	2035 additional emissions reductions (MMT) from target	Total cumulative emissions reductions (target and BAU) in MMT
Asia Oceania	492	404.6	0	0%	0	185.59
Brazil	775	369.6	0	0%	0	144.13
China	3172	4033.05	861.05	7%	761.76	2813.34
European Union	2111	1437.1	0	0%	0	301.40
India	691	1247.75	556.75	16%	495.73	966.75
Indonesia	71	274.015	203.015	26%	39.35	47.88
Japan	505	457.1	0	0%	0	55.99
OECD Americas	779	522.2	0	0%	0	124.73
Russia	538	592.55	54.55	3%	52.00	240.74
South Africa	32	158.9	126.9	28%	114.57	129.92
United States	1992	1902.25	0	0%	0	476.90
Total	**11158**	**11399.115**	**1802.265**	**1%**	**1463.41**	**5487.37**

TABLE 9

Scenario 4: 40 percent renewable energy (including hydro) and nuclear electricity generation by 2035 target

MEF country or region*	2035 BAU RE plus nuclear Gen (TWh)	40/35 RE plus nuclear target (TWh)	Additional RE plus nuclear Gen needed to meet target (TWh)	RE plus nuclear Gen percent increase share of overall Gen to reach target	2035 additional emissions reductions (MMT) from target	total cumulative emissions reductions (target and BAU) in MMT
Asia Oceania	492	462.4	0	0%	0	185.59
Brazil	775	422.4	0	0%	0	144.13
China	3172	4609.2	1437.2	12%	1271.47	3323.05
European Union	2111	1642.4	0	0%	0	301.40
India	691	1426	735	21%	654.44	1125.46
Indonesia	71	313.16	242.16	31%	46.94	55.47
Japan	505	522.4	17.4	1%	9.64	65.63
OECD Americas	779	596.8	0	0%	0	124.73
Russia	538	677.2	139.2	8%	132.69	321.43
South Africa	32	181.6	149.6	33%	135.07	150.41
United States	1992	2174	182	3%	124.17	601.07
Total	**11158**	**13027.56**	**2902.56**	**6%**	**2374.42**	**6398.38**

Note: N-H = nonhydro; RE = renewable energy; Gen = generation; BAU = business as usual; MEF = Major Economies Forum

* The following Major Economies Forum countries' data are captured under the regions specified: Australia (Asia Oceania), France (European Union), Germany (European Union), Italy (European Union), South Korea (Asia Oceania), Mexico (OECD Americas), and the United Kingdom (European Union). Due to the lack of country-level data for certain Major Economies Forum and non-Major Economies Forum countries from the International Energy Agency, we used 2030 projections for Indonesia and South Africa, and we were unable to exclude three non-Major Economies Forum countries: Chile, Israel, and New Zealand. In this analysis, Asia Oceania excludes Japan and OECD Americas excludes the United States.

Sources: International Energy Agency (World Energy Outlook 2012); The Institute of Energy Economics-Japan, The ASEAN Centre for Energy and The National ESSPA Project Teams (The 3rd ASEAN Energy Outlook); the South Africa Department of Energy (Integrated Resource Plan for Electricity 2010-2030); and the U.S. Energy Information Administration (International Energy Statistics for 2010).

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