Comments on IEA/WEO2016 Presentation of Dr. Fatih Birol - Focusing on China's Climate Change Policies and Actions after the Paris Agreement

"There is no single story about the future of global energy: in practice, government policies will determine where we go from here." -Dr Fatih Birol, the IEA's Executive Director

<Contents>

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IEEJ International Energy Symposium

25 November 2016, Hotel Grand Palace, Tokyo, Japan

1. The Outline of China's INDC

★China made great contributions to producing the Paris Agreement and putting the agreement into force as early as possible.

★ Key Points of China's INDC:

First, China recognized and declared that tacking climate change is the intrinsic requirement of China's sustainable development as well as the international obligation of a responsible major country.

Second, China has nationally determined its overall targets by 2030 as follows:

- To lower carbon dioxide emissions per unit of GDP by 60% to 65% from the 2005 level;
- To increase the share of non-fossil fuels in primary energy consumption to around 20%; and
- To increase the forest stock volume by around 4.5 billion cubic meters on the 2005 level;
- To achieve the peaking of carbon dioxide emissions around 2030 and making best efforts to peak early.

1. The Outline of China's INDC

Third, in order to achieve these action objectives, **China has nationally determined an comprehensive policy package with 15 measures including introduction of Emission Trading Market as well as achievable numerical targets in detail for low-carbon energy development.**

For instance,

the State Council released the **"Energy Development Strategy Action Plan (2014-2020)"** on November 19, 2014, which **sets the targets by 2020** to expand the installed capacity of **hydropower, wind and solar PV** to 350 GW, 200 GW and 100 GW, respectively. The targets for **nuclear power** are set at 58 GW for operating capacity and a minimum of 30 GW for construction capacity. **However, the INDC does not mention the hydropower and nuclear targets specified in the Strategy Action Plan**; perhaps due to rising uncertainty in development **and to avoid losing face before the international community in case of missing these numerical targets.** This shows the difficulty of developing an energy plan that can meet international commitments without fail.

**Development of hydropower is facing issues such as migrants and rising costs associated with dam construction, while nuclear development is facing problems such as repeated delays in the construction of the US third-generation reactor AP1000 and public opposition to inland NPP construction.

2. China's Comprehensive Policies and Actions towards Achieving the INDC

After the Paris Agreement entering into force on 4 November, **how to achieve the INDC efficiently** should be the main task for all countries, and China is no exception.

2.1 Promoting Energy Revolution and International Cooperation

On June 13, 2014, President Xi held the sixth meeting of Central Leading Group for Economic and Financial Affairs, in which he announced promoting a four-part "energy revolution" and international cooperation.

★**Without "energy revolution", the INDC couldn't be achieved effectively !!!**

Energy revolution strategy promoted by Xi Jinping leadership (issued in June, 2014)

・**Consumption revolution**: Controlling overall energy consumption by implementing exhaustive energy saving measures in all phases of socio-economic development and all consumption areas, firmly holding the strategic priority of energy saving
・**Supply revolution**: Diversifying energy sources by developing energies other than coal, while strongly promoting the clean and efficient use of coal; At the same time, strengthening the development of transportation, electricity transmission and distribution infrastructure and storage facilities
・**Technological revolution**: Enhancing the development of green and decarbonization technologies, and reinventing the relevant industries into a new industry that can drive economic growth and elevate the level of the overall industry
・**Management system revolution**: Developing a competitive market by highlighting the commercial aspects of energy, focusing particularly on building the market-driven pricing mechanism and improving the legal system
・**Stronger international cooperation**: While domestic issues remain the highest priority, strengthening international cooperation in all possible areas related to energy production and consumption, to use international resources efficiently

Sources: Li Zhidong compiled.

2.2 Strengthening Top-level Planning of Low-carbon Development

China's National Plan on Climate Change for 2014–2020, issued in September 2014; **Action Plan on Energy Strategies for 2014–2020**, issued in November 2014	Overall target	・To reduce CO_2–GDP intensity by 40 to 45% from 2005 levels by 2020
	Targets for energy supply/demand, and energy mix	・To keep energy consumption below 4.8 billion tce and coal consumption below 4.2 billion tons by 2020
		・To increase domestic energy production to about 4.2 billion tce by 2020, and keep the self–sufficiency ratio around 85%
		・By 2020, to raise the percentage of non–fossil energy (renewable energy plus nuclear energy) in primary energy consumption to 15%, the share of nature gas to above 10%, and reduce the share of coal to below 62%
	Targets by energy sources	・By 2020, expanding general hydropower capacity to 350 GW; expanding wind power generation capacity to at least 200 GW, and decreasing the electricity sales price to match that of coal–fired thermal (on average 0.41 yuan/kWh nationwide as of October 2014); Expanding solar power generation capacity to at least 100 GW, and decreasing the sales price (currently 0.9–1.0 yuan/kWh) to match that of the electricity tariff (consumer purchase price of electricity from electricity transmission companies)
		・By 2020, increasing nuclear power capacity to 58 GW, and the capacity under construction to 30 GW
		・By 2020, reducing the distributed use of coal in residential and industrial sectors, and using it centrally in the power generation sector, where the ratio of coal is increased to above 60% from 50% in 2013. At the same time, all new coal–fired thermal power plants must have a net thermal efficiency of at least 41% and fulfill an emission standard equivalent to that of gas thermal plants, while existing plants must improve the net thermal efficiency to at least 39.6% by 2020 from 38.3% in 2013.
		・By 2020, expanding the supply capacity of nature gas to 400–420 billion m^3 (consumption was at 167.6 billion $m^3$3 for 2013), including 30 billion m^3 of shale gas and coal–bed methane, respectively.
"Made in China 2025" plan issued on May 19, 2015		**・To reduce Energy–GDP intensity in manufacturing sector by 18% by 2020 and 34% by 2025 from 2015 levels**
		・To reduce CO2–GDP intensity in manufacturing sector by 22% by 2020 and 40% by 2025 from 2015 levels
The U.S.–China Joint Announcement on Climate Change, issued on November 11, 2014; **Enhanced Actions on Climate Change: China's Intended National Determined Contributions**, submitted on June 30, 2015		**・To achieve the peaking of CO2 emissions around 2030 and to make best efforts to peak early**
		・To lower carbon dioxide emissions per unit of GDP by 60% to 65% from the 2005 level
		・To increase the share of non–fossil fuels in primary energy consumption to around 20% by 2030
		・To increase the forest stock volume by around 4.5 billion cubic meters on the 2005 level
		・To continue to work to increase ambition over time
13th Five–Year Plan on National Economic and Social Development, released in March 2016; **Industrial Green Development Plan (2016–2020)"**, issued on July 18; **The 13th Five–Year work plan for greenhouse gas emission control**, issued on November 4		・To set a binding target of reducing the energy-GDP intensity in 2020 by 15% from 2015 and the CO_2-GDP intensity by 18%. ・To set targets of cutting energy intensity by industry by 18% and the emissions intensity by 22%. ・To limit energy consumption at 5 billion tce and coal consumption at 4.2 billion tons by 2020. ・To raise the share of non–fossil energy in primary energy consumption to 15%, the share on natural gas to 10% by 2020. ・Require bringing CO2 emissions of some industry sectors close to the peak by 2020, and encourage 23 pioneering cities to peak emissions by 2030. ・To increase annual sales of New Energy Vehicles (NEVs) to 2 million units in 2020 and expand the cumulative output and sales to 5 million units.

Sources: Li Zhidong compiled.

13th Five–Year Plan and Roadmap towards targets for 2020 and 2030

	Level					Cumulative change rate				Rate of change from 2005		
	2005[a]	2010[a]	2015[a]	Targets for 2020[a,b]	Targets for 2030[c]	10/05	15/10	20/15	30/20	2015	2020	2030
Energy-GDP intensity	100.0	80.9	66.2	56.3		-19.1%	-18.2%	-15.0%		-33.8%	-43.7%	
Share of non-fossil fuels in total primary energy consumption	7.5%	8.3%	12.0%	15.0%	20.0%							
CO_2-GDP intensity	**100.0**	**80.2**	**62.9**	**51.6**	**35.0**	**-19.8%**	**-21.6%**	**-18.0%**	**-32.1%**	**-37.1%**	**-48.4%**	**-65.0%**

Notes: a) Figures for 2015and earlier years are actual, based on official releases, and figures for 2020 are targets set in the 13th Five-Year Plan. b) Targets for 2020 set in China's voluntary action plan submitted to the UN in 2010 is to reduce the CO_2-GDP intensity by 40-45% from 2015 level. Fulfilling the target in the 13th Five-Year Plan will result in a 48.4% reduction of the CO_2-GDP intensity, exceeding the target submitted ot the UN. c) Even the target in the 13th Five-Year Plan has been reached, an average annual reduction of 3.8% , or a cumulative reduction of 32% between 2020 and 2030, is needed for reducing emissions by 65% in 2030 from the level of 2005, which has been set as the upper limit of reduction targets in China's INDC.

Sources: Compiled by Li Zhidong.

The Outline of 13th Five-Year work plan for GHG emission control (2016/11/4)

	「第13次5カ年計画における温室効果ガス抑制活動方案」(2016/11/4公表)の骨子
2020年目標	・炭素排出量を効果的に抑制し、2030年頃のできるだけ早い時期にCO_2排出量をピークアウトさせる目標の達成を推進する
	・GDP当たりCO_2排出量を2020年に2015年比18%削減（INDC目標は、2020年に2005年比40～45%減、2030年に60～65%減。2015年実績は2005年比37.1%減）
目標達成のための政策措置	1、低炭素化でエネルギー革命を推進
	・エネルギー起源二酸化炭素排出量の抑制を強化
	☆一次エネルギー消費量を2020年に50億トン（石炭換算）以内に抑制(2015年実績は43億トン)
	☆一次エネルギー消費のGDP原単位を2020年に2015年比15%削減、大型発電企業集団の送電電力量当たり二酸化炭素排出量を550kg/kWh以下に
	☆一次エネルギー消費に占める非化石エネルギー比率を15%までに引き上げる（2015年実績は11.2%、2030年目標は20%）
	・省エネを力強く推進
	・非化石エネルギーの利用を加速
	☆積極かつ秩序よく水力発電開発を推進し、発電設備容量（揚水を除く）を2020年に3.4億kWへ拡大(2015年実績は2.97億kW)
	☆安全確保の元で、原子力発電開発を効率よく行う。2020年に稼動容量を5,800万kWへ、5年間3,000万kW以上を新規着工(2015年末実績、稼働中が28基2,643万kW、建設中が26基2,913万kW、合計54基5,556万kW)
	☆安定かつ着実に風力発電開発を行う。2020年に稼動容量を2億kWへ（2015年実績は1.31億kW）
	☆太陽光・熱発電開発を加速させ、太陽光発電の設備容量を2020年に1億kWへ拡大（2015年実績は4,318万kW）
	☆地熱その他：地熱、バイオマス、海洋エネルギーの開発を積極的に行う
	・化石エネルギーの最適化利用を図る
	☆石炭消費量を2020年に42億トン前後に抑制、PM2.5汚染の深刻な地域と都市の石炭消費量が2017年以降でも継続的に減少させる
	☆天然ガスの利用規模を拡大し、一次エネルギー消費に占める比率を2020年に10%に高める(2015年実績は5.9%)
	2、低炭素産業体系を構築する
	・産業構造の調整を加速する。2020年に、GDPに占める第3次産業の比率を2015年の50.5%から56%へ、戦略的新興産業の比率を15%へ高める。エネルギー多消費製品、汚染廃棄物他排出製品および自然資源多消費製品の輸出を厳格に規制し、輸出構造の最適化を図る。
	・工業部門の排出を抑制する。2020年に、工業部門付加価値当たりCO2排出量を2015年比22%削減し、総排出量をフラット化し、鉄鋼や窯業土石等重点産業のCO2排出量を効果的に抑制する。工業部門HFCs抑制行動計画を制定し、HFC-23の排出基準を達成し、5年間で11億トン（CO2換算トン）以上を削減する。$CHClF_2$の生産と使用を段階的に削減し、2020年に2010年比35%削減する。工業部門におけるCCUS実証実験を推進し、環境リスク評価を着実に行う。
	・低炭素型農業（畜産業含む）発展の推進。2020年に、耕地からのN_2O排出量をピークアウトさせる。
	・生態系による炭素吸収の増加。2020年に、森林面積率を2015年の21.66%から23.04%へ高め、森林蓄積量を151.37億㎥から165億㎥へ拡大する
	3、低炭素都市化の推進
	・都市低炭素化建設と管理の強化。2020年新築建築物に占めるグリーン建築の比率を50%とする
	・低炭素交通輸送システムの構築。鉄道、水運等低炭素輸送手段の発展を加速し、航空航海と道路輸送の低炭素化を推進する。2020年に、道路輸送トンキロ当たり炭素排出量を2015年比8%減、人キロ当たり排出量を2.6%減、船舶輸送トンキロ当たり排出量を7%減とする。2020年に、電気自動車（BEV）とプラグインハイブリッド車（PHEV）の生産能力を200万台、累積生産・販売量を500万台とする。乗用車燃料消費量規制の厳格な実施を図り、大型商用車燃料消費量規制値を厳格化する。新車炭素排出基準を研究する
	・廃棄物の資源化利用と低炭素化処理を強化する
	・低炭素型生活様式を提唱する
	4、地域における低炭素発展の加速
	・発展段階、資源賦存状況、環境容量等地域間の差異を考慮して、差異のある炭素排出原単位削減目標を割り当てる。北京、天津、河北、上海、江蘇、浙江、山東、広東は20.5%減、福建、江西、河南、湖北、重慶、四川は19.5%、山西、遼寧、吉林、安徽、湖南、貴州、雲南、陝西は18%減、内モンゴル、黒龍江、広西、甘粛、寧夏は17%減、海南、チベット、青海、新疆は12%減と規定
	・率先ピークアウトの推進。最適開発地域の2020年前までのピークアウトを支持する。その地域に対し、ピークアウト目標の設定とピークアウトロードマップの明確化を推奨し、一部の発展先進地域における炭素排出量総量規制の導入を研究、模索する。「Alliance of Peaking Pioneer Cities of China」(23か所)とその他条件の整えた都市における率先ピークアウトの達成を激励する
	・低炭素地域発展モデルの創出。準ゼロエミッションモデル実験を展開し、2020年までに50か所を完成する。国家低炭素都市実験を100都市に拡大する。国家低炭素町造り実験を30か所、低炭素工業団地実験を80か所へ拡大し、20か所の国家低炭素産業団地モデルを創設する。1000か所で低炭素コミュニティ実験を展開し、国家低炭素コミュニティモデル100か所を創設する
	・貧困地域における低炭素発展を支持、支援する
	5、全国排出量取引市場を建設、開設する
	・全国排出権取引市場の整備。「炭素排出権取引管理条例」とその関連細則を制定する
	☆8業種（電力、鉄鋼、非鉄金属、窯業土石、紙パルプ、石化、化工、航空）の年間エネルギー消費量が1万tce（石炭換算トン、1tce＝7×106）以上の企業を対象とする炭素排出権割り当て案を制定し、割り当て管理を実施する
	☆規模以上の自動車企業に、新エネ自動車（NEV)比率を課し、NEV目標対数に対応する炭素削減枠の達成を義務付けるNEV規制・炭素削減枠管理制度を実施する
	・全国排出権取引市場を2017年に開設する。2020年までに、健全化された制度、活発な取引、厳格な監視管理、公開的で透明性の高い全国排出権取引市場を形成させる
	・全国排出権取引を支える制度、インフラ、人材などの基礎能力を強化する
	6、低炭素科学技術のイノベーションの強化
	・気候変動に関する基礎研究の強化　・低炭素技術開発と導入拡大に向けたモデル実験の加速　・低炭素技術導入拡大の力強い推進
	7、低炭素基礎能力の強化
	・気候変動関連法律法規及び標準体系の健全化　・GHG排出量統計と測定制度の健全化　・GHG排出量公報制度の創設　・低炭素発展政策体系の健全化（一般会計による資金投入の増加、PPPとグリーン債券等の活用、政府グリーン購入制度の健全化、低炭素発展優遇税制の設計、エネルギー価格改革の加速、省エネと低炭素化を阻害する化石エネルギー補助金の整理と段階的廃止、低炭素地域連携体制の健全化）　・組織整備と人材育成の強化
	8、広範な国際協力の展開
	・地球気候変動ガバナンスへの更なる参画。共通だが責任のある原則、公平性原則、応分責任原則を堅持し、「パリ協定」関連交渉の積極的参画、枠組み条約の全面的、効果的、継続的実施を推進する
	・実務的協力の推進。気候変動に関する南南協力を進化させ、中国気候変動南南協力基金を実務的に効果的に運用し、途上国の気候変動対応能力と防災減災能力を高める。「一帯一路」戦略および国際生産能力・設備製造協力を通じて、低炭素プロジェクト協力を促進し、海外投資の低炭素化を推進
	・履行活動の強化。「パリ協定」を履行する国内取組みを着実に行う。国家インベントリー作成と提出、隔年更新報告の提出を遅滞なく行う。約束草案（INDC)の評価・点検を強化し、2018年促進的対話に積極的に参画する。2050年長期低炭素発展戦略を作成し、国連に提出する
	9、実施措置の強化
	・組織的指導の強化　・目標達成責任を問う問責制度の導入　・資金投入の増大　・宣伝、啓蒙活動の効果的展開

出所：国務院「第13次5カ年計画における温室効果ガス抑制活動方案」(2016/11/4公表)等に基づき、李が作成。

2.3 Placing much emphasis on market-orient measures such as carbon pricing system and energy price reforms

China's main policies for addressing climate change based on FYP: Past, Current and Future

5カ年計画でみる中国における主要温暖化対策の推移と今後の展望

	Historical shift up to 12th Five-Year Plan			Perspective after Paris Agreement	
	10th FYP (2001～2005)	11th FYP (2006～2010)	12th FYP (2011～2015)	13th FYP (2016～2020)	From 14th FYP (after 2021)
	No binding targets	Some binding targets	Towards Post Kyoto	Towards Paris Agreement	Towards long-term targets
Energy conservation	Expectation	**Binding**	**Binding**	**Binding**	**Binding**
Total volume control of energy consumption	Expectation	Expectation	Strong Expectation	**Binding**	**Binding**
Development of non-fossil energy	Expectation	Expectation	**Binding**	**Binding**	**Binding**
Increasing carbon dioxide sink by forest	Expectation	**Binding**	**Binding**	**Binding**	**Binding**
Reducing CO_2 intensity			**Binding**	**Binding**	**Binding**
Total volume control of CO_2 consumption				Start in some developed regions	**Binding**
Emission trading			Started in 7 regions	Start in 2017 for 8 industries	Expand to all industries
Trading system for energy consumption				Start in 4 regions from 2017	Expand to all regions
Carbon tax				Pilot start?	Introduce in all regions
Full-amount purchase of renewable generation				Start in 2016	Continue
RPS and Green Certificate trading system for non-hydropower renewable elec.				To be introduced	Continue
CAFC regulation and CAFC-Credits trading system			Regulation only	Regulation and trading from 2018	Continue
NEV regulation and NEV-Carbon Emission Reduction quota trading system				Start in 2018	Continue

注） ①「期待値」は達成が望ましいとされる努力目標、「拘束値」は達成責任が問われる拘束力のある必達目標、「強い期待値」は「拘束値」に近い「期待値」。

②CAFCはCorporate Average Fuel Consumption、NEVはNew Energy Vehicleの略。関連取引とは、目標を割り当て、達成すれば期限付きバンキング、販売可能なクレジットを獲得し、目標未達の場合、罰金を支払うか、クレジットを市場から購入しなければならない制度。カリフォルニア州のZero Emission Vehicle-Creditsが有名。

出所：過去の推移は関連5カ年計画による。将来展望は政府機関HPに公表される関連計画、制度設計文書（案を含む）、要人発言等に基づく。李が作成。

3. Typical Study on Long-term Strategies in China Compared to IEA/WEO2016

Main findings in the study of China 2050 low carbon development strategies conducted by the members of National Center for Climate Change and International Cooperation (NCSC/China) (2015/6)

国家気候変動戦略研究・国際協力センターによるINDC実現を前提とする2050年低炭素戦略の研究結果（政府案ではなく、論文ベース）

	2005	2010	2015	2020	2030	2040	2050	2005–2020	2020–2030	2030–2050	Changes in 2050 from 2005	Changes in 2050 from 2010
	Upper row: Y2005=100; Lower row: level							CAAGR (%)				
Population	100	103	105	108	112	112	111	0.51	0.36	−0.04	11	8
Real GDP per capita	100	166	235	321	517	783	1103	8.09	4.88	3.86	1,003	564
Primary energy consumption per real GDP	100	81	68	59	43	29	18	−3.46	−3.11	−4.26	−82	−78
CO2−Energy intensity	100	98	94	89	80	63	39	−0.77	−1.06	−3.53	−61	−60
CO2−GDP intensity	100	79.4	63.9	52.5	34.4	18.3	7.0	−4.20	−4.14	−7.64	−93	−91
CO2	100	135	158	182	201	158	84	4.07	1.00	−4.27	−16	−38
Population (million)	1,304	1,338	1,369	1,408	1,460	1,460	1,447	0.51	0.36	−0.04	11	8
Real GDP per capita (Y2010 US$/Person)	2,717	4,515	6,385	8,722	14,047	21,274	29,969	8.09	4.88	3.86	1,003	564
GDP (Billion Y2010 US$)	3,543	6,041	8,742	12,283	20,515	31,070	43,378	8.64	5.26	3.81	1,124	618
Energy−GDP intensity (toe/million Y2010 US$)	501	409	341	296	215	145	90	−3.46	−3.11	−4.26	−82	−78
Primary energy consumption (Million toe)	1,775	2,469	2,978	3,631	4,420	4,514	3,912	4.89	1.99	−0.61	120	58
CO2−Energy intensity (t−CO2/toe)	3.0	3.1	2.8	2.7	2.4	1.9	1.2	−0.77	−1.06	−3.53	−61	−62
CO2−GDP intensity (t−CO2/million Y2010 US$	1,518	1,266	970	797	522	277	107	−4.20	−4.14	−7.64	−93	−92
CO2 (million t−CO2)	5,376	7,645	8,494	**9,784**	**10,806**	**8,494**	4,516	4.07	1.00	−4.27	−16	−41
CO2 per capita (t−CO2/person)	4.1	5.7	6.2	6.9	7.4	5.8	3.1	3.54	0.63	−4.23	−24	−45
IEA/WEO−2016: CO2												
Current Policies Scenario				9,575	10,936	11,589						
New Policies Scenario				**9,174**	**9,342**	**8,779**						
450 Scenario				8,802	6,421	3,392						

注：GDPは2010年基準の実質価格である。

出所：上段の倍率は、国家気候変動戦略研究・国際協力センター傅莎、邹骥、刘林蔚「中国INDC解読」(2015/6/30)、「中国INDCに関する幾つかの評論」(2015)、(http://www.ncsc.org.cn/article/yxcg/zlyj/201506/20150600001484.shtml、http://files.ncsc.org.cn/www/201507/20150702114814244.pdfを参照）による。下段の水準について、2005年と2010年は実績値、IEEJ/EDMC「エネルギー・経済統計要覧2016」による。2015年以降は、倍率と2015年実績に基づき、李が算出。

Another typical study, "Reinventing Energy: China－energy consumption and supply innovation roadmap 2050", an international joint research program led by the Energy Research Institute of China (ERI/China), unveiled at the G20 Energy Efficiency Forum held on September 6, concluded that **CO2 emissions will peak around 2025**, and **will be reduced by 42% from 2010 levels by 2050** through energy conservation and expansion of non-fossil energies.

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