## Apple: Supplier Clean Energy Program

- Launched October 2015
- 2020 goal: 4GW additional clean energy
- 71 manufacturing partners in 17 countries have committed to 100 percent renewable energy for Apple production (as of July 2020) = equivalent to 8 GW
- Japanese companies already committing themselves to 100% renewable for Apple.
  - Dexerials Corporation, IBIDEN Co., Keiwa Incorporated, Nidec, Nitto Denko Corporation, Seiko Advance Ltd., Sony Semiconductor Solutions, Taiyo Holdings Co., Ltd.



## "Sony warns it could move factories over Japanese energy policy"



- Sony warns it could move factories over
   Japanese energy policy (Financial Times, 27 Nov. 2020)
  - "So they told me either we do something about renewables or they have to move out of Japan." (Minister Kono)

<u>https://www.ft.com/content/bbd59494-ac64-4dda-8da5-a2990d8936d3</u> ※規制改革推進会議第4回再生可能エネルギー等に関する規制等の総点検タスクフォース(2021年2月3日) Sony 神戸専務の報告 https://www.youtube.com/channel/UC06V Ro0hwfbhCmTIoWFNLA 57分あたりから

# Business risk due to difficulty in procuring renewable energy

Japanese companies have faced business risk leading to 73 billion dollars.



Source: BloombergNEF, Bloomberg Terminal

Note: Chart is based on data available on Bloomberg's SPLC function, and does not necessarily represent the entire supply chain for this group of selected companies.

# Business risk due to difficulty in procuring renewable energy

Japan is the country with the second highest business risk after the US.



Source : BloombergNEF, 2020

## Emission intensity of electricity (2020) (grams CO2/kWh)

Japan is the one of countries with highest emission intensity



Source : BloombergNEF, 2020

# Financial institution and investors are changing and change business behavior

- UNPRI (Principles for Responsible Investment) and ESG investing
- Linked to disclosure of climate related risk, covering the whole supply chain
  - CDP (previously, Carbon Disclosure Project)
  - Recommendations by Task Force on Climate-related Financial Disclosures (TCFD) (June 2017)
- "Engagement, Voting and Divestment"
  - For instance, Norwegian Government Pension Fund (with about One trillion US dollar) has made divestment (about 8 billion US dollar) from 122 companies, more than 30% of business of which depends on coal exploitation and power generation (since 2016)
  - Engagement: Climate Action 100+
  - Revision of loan policy for new coal fired plants

# Global Sustainable Investing Assets (2018)

Region	2016	2018
Europe	\$ 12,040	\$ 14,075
United States	\$ 8,723	\$ 11,995
Japan	\$ 474	\$ 2,180
Canada	\$ 1,086	\$ 1,699
Australia/New Zealand	\$ 516	\$ 734
TOTAL	\$ 22,890	\$ 30,683

Note: Asset values are expressed in billions of US dollars. All 2016 assets are converted to US dollars at the exchange rates as of year-end 2015. All 2018 assets are converted to US dollars at the exchange rates at the time of reporting.



Source: Global Sustainable Investment Alliance, 2019

## TCFD

- On June 2017, the Task Force on Climate-related Financial Disclosures (TFCD) established by Financial Stability Board (FSB) released its final report.
- Letter from Michael R. Bloomberg (Chair of the TCFD) to Mark Carney (Chairman of the FSB)
  - '...recommendations for helping businesses disclose climate-related financial risks and opportunities within the context of their existing disclosure requirements'.
  - '...without effective disclosure of these risks, the financial impacts of climate change may not be correctly priced – and as the costs eventually become clearer, the potential for rapid adjustments could have destabilizing effects on markets'.
  - '...That will lead to smarter, more efficient allocation of capital, and speed the transition to a low-carbon economy'.

# TCFD: Financial impact of climate related risks and opportunities



## Climate Action 100 +

- Climate Action 100+(launched in December 2017)
  - More than 540 investors with more than USD \$52 trillion in assets under management have signed on to the initiative (as of January 2021)
  - The initiative aims to secure commitments from the boards and senior management to:
    - Implement a strong governance framework which clearly articulates the board's accountability and oversight of climate change risk and opportunities.
    - Take action to reduce greenhouse gas emissions across their value chain, consistent with the Paris Agreement's goal.
    - Provide enhanced corporate disclosure in line with the final recommendations of the Task Force on Climate-related Financial Disclosures (TCFD)
  - The 167 focus companies have the highest combined direct and indirect Scope
    - 1, 2 and 3 emissions (emissions associated with the use of their products)
      - Daikin Industry, Hitachi, Honda, JX holdings, Nippon Steel, Nissan, Panasonic, Suzuki, Toray, Toyota are targeted Japanese companies.
  - Asset Management One, Dai-ichi Life Insurance, Fukoku Capital Managemet, Mitsubishi UFJ Trust & Banking Corporation, Nikko Asset Management, Nomura Asset Management Co., Resona Asset Management Co., Sompo Asset Management, Sumitomo Mitsui DS Asset Management Company, Sumitomo Mitsui Trust Bank, The Dai-ichi Frontier Life Insurance Co., Sophia School Corporation and Sumitomo Life join the initiative.
  - Government Pension Investment Fund (年金積立金管理運用独立行政法人; GPIF) also joins the initiative in October 2018.

## Canon vs Kodak



#### WilderHill New Energy Global Innovation Index (NEX) versus NYSE Arca Oil Index, full year 2020 (rebased)



Source: BloombergNEF. NEX is WilderHill New Energy Global Innovation Index

## Global Power Generation Mix (Bloomberg NEF, 2020)

Unprecedented energy shift to renewables has been taking place. Renewables will amount to 69% and fossil fuels will decline to 24% by 2050.



Source: BloombergNEF, IEA





Source : Bloomberg NEF, 2021

### 最終エネルギー消費に占める再生可能エネルギー Renewable Energy in TFEC by Sector

Source : REN21, 2020



Note: Data should not be compared with previous years because of revisions due to improved or adjusted methodology.

Source: Based on IEA data. See endnote 50 for this chapter.

## **Energy Transition Investment**

Since 2014, more than 300 billion US \$ has been invested in clean energy. More than twice than investment in coal and gas (around \$130 billion)



Source: BloombergNEF

\$ billion

## Global sales of vehicles (left) Global safes of EV (right)



Global sales of electric passenger vehicles – cars, vans and small trucks – and market share, indicated by a red line (right chart). Total light-duty vehicle sales (left). 出典: IEA,2020. 45

## Global sales of EV(2020)



Source: IEA,2021.

https://www.iea.org/commentaries/how-global-electric-car-sales-defied-covid-19-in-2020

### 3D : Decarbonization, Decentralization and Digitalization Innovation progresses across the sectors (through sector coupling)



Source: IRENA, 2017 47

### Sector coupling Power to X

#### Sector coupling – an integrated energy system based on renewable electricity





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Source: Kerstine Appunn, 2018

## **Green Recovery**

- 「グリーン・リカバリー(緑の復興; Green Recovery)」
  - 感染症によってダメージをうけた経済と社会を環境に配慮した 脱炭素で、災害にも強いレジリエント(強靱)な社会・経済に、そ して生態系と生物多様性を保全する方向に、グリーンに復興し ていこうというもの
- 「よりよい未来に向けた復興(Build Back Better)」
  - グテーレス国連事務総長(2020年4月2日)
    - « We simply cannot return to where we were before COVID-19 struck, with societies unnecessarily vulnerable to crisis. We need to build a better world. »
    - 「私たちは、危機に不必要に脆弱な社会とともに、新型コロナウイル スの前にいたところに戻ることはできない。よりよい世界を構築する 必要がある」
- 「グレート・リセット(The Great Reset)」
- 「経済・社会のリデザイン(再設計)」

## Green Growth Strategies 14 focal areas

Transformational change in industries and economy through aggressive climate policies

2030 target and measures to achieve it under consideration toward next spring (May)

### **Energy related**

- Offshore wind 45GW by 2040
- Green fuels
   (Ammonia)
- Hydrogen
- Nuclear

Transport and Manufacturing related

- Automobile
   Batteries
- Semi-conductor ICT
- Shipping
- Infrastructure etc
- Food and Agriculture/ Fishing
- Aviation
- Carbon recycling

### Housing and office

- Homes and Buildings
- Circular
   Economy
- Lifestyle related

## Changing approach in climate governance

- Presenting and sharing a long term vision/goal = vision for future society
  - Facilitate understanding of the scale of problem and identifying challenges
  - Aiming to incentivize innovation, investment, actions by States and non State actors...
- Internalization and mainstreaming of climate related risk consideration in business strategy and decision making
  - Through climate related financial disclosure (TCFD)
  - Impacted by investors' evaluation and behavior
  - Through emission management and reduction over its supply chain and value chain
- Narrative related to climate policy is changing
  - Climate action is not simply for environment, which influences corporate value from / corporate evaluation by capital market as well as from suppliers
- Climate policies as a part of stimulus package for recovery from COVID-19
- Approach is spreading to other issues
  - Engagement launched by Norwegian Government Pension Fund to integrate consideration on marine plastic issue into business strategy (September 2018)
  - Launch of Task force on Nature related Financial Disclosures (TNFD) (2020)
  - Ex. EU taxonomy for sustainable activities

#### Individual investors shows the most interest in targeting Climate change and Plastic reduction



Source: Takamura based on Morgan Stanley, 2019

# Perspectives and challenges for carbon neutrality by 2050(1)

- Decarbonization of energy sector is critical.
  - CO2 emission from energy use accounts for 85% of Japan's GHG emissions (2019).
  - Decarbonization of power sector, by
    - Renewables
    - Nuclear
    - Thermal power generation with CO2 abatement (such as CCS)
  - Decarbonization of energy sectors other than power sector (heat, transport)
    - About half of Japan's emissions from energy use comes from sectors other than power sector
    - Electrification + existing low carbon technologies + new technologies
  - One of the most important challenges: COST

### Concept of carbon neutrality by 2050 (Green Growth Strategy, 2020)



# Perspectives and challenges for carbon neutrality by 2050 (2)

- Perspectives for carbon neutrality by 2050
  - Clear long-term goal is essential to identify challenges for achieving it and to enhance understanding of them, which provide guidance and incentive for actions and investment by private sector.
  - Needs for analysis for plural scenarios.
  - Backcasting from "To Be in 2050" to explore "to be in 2030" as milestone
- 2 key directions with different time horizons
  - Accelerating existing technologies to reduce emissions as much as possible
    - For climate actions
    - For enhancing competitiveness
    - For green recovery from COVID-19
  - R & D for developing new technologies
    - Challenge: uncertainty of cost and of feasibility

### 参考1: IPCC 1.5℃特別報告書 4つの代表的排出経路におけるCCS量

 IPCC 1.5℃特別報告書の4つの代表的排出経路におけるCCS累積量はP3シナリオにおいて6,870億tCO2 (687GtCO2)である。最もCCSに依存するP4シナリオでは1兆2,180億tCO2 (1,218GtCO2)である。

#### Breakdown of contributions to global net CO<sub>2</sub> emissions in four illustrative model pathways



Source : IPCC (2018) Global Warming of 1.5℃ Summary for Policy makers

#### EU戦略的長期ビジョン(A Clean Planet for all) シナリオ分析: 8つのシナリオ

- 1) 2 ℃を十分に下回る水準(1990年比8割削減): ELEC、H2、P2X、EE、CIRC
- 2) 1)と3)の橋渡しとなるシナリオ: COMBO
- 3) 1.5℃目標達成のために2050年ゼロエミッション達成: 1.5TECH、1.5LIFE

#### Long Term Strategy Options

	Electrification (ELEC)	Hydrogen (H2)	Power-to-X (P2X)	Energy Efficiency (EE)	Circular Economy (CIRC)	Combination (COMBO)	1.5°C Technical (1.5TECH)	1.5°C Sustainable Lifestyles (1.5LIFE)
Main Drivers	Electrification in all sectors	Hydrogen in industry, transport and buildings	E-fuels in industry, transport and buildings	Pursuing deep energy efficiency in all sectors	Increased resource and material efficiency	Cost-efficient combination of options from 2°C scenarios	Based on COMBO with more BECCS, CCS	Based on COMBO and CIRC with lifestyle changes
GHG target in 2050	-80% GHG (excluding sinks) ["well below 2°C" ambition]				-90% GHG (incl. sinks)	-100% GHG ["1.5°C" :	(incl. sinks) ambition]	
Major Common Assumptions	<ul> <li>Higher energy efficiency post 2030</li> <li>Deployment of sustainable, advanced biofuels</li> <li>Moderate circular economy measures</li> <li>Digitilisation</li> </ul>			<ul> <li>Market coordination for infrastructure deployment</li> <li>BECCS present only post-2050 in 2°C scenarios</li> <li>Significant learning by doing for low carbon technologies</li> <li>Significant improvements in the efficiency of the transport system.</li> </ul>				
Power sector	Power is nearly decarbonised by 2050. Strong penetration of RES facilitated by system optimization (demand-side response, storage, interconnections, role of prosumers). Nuclear still plays a role in the power sector and CCS deployment faces limitations.							
Industry	Electrification of processes	Use of H2 in targeted applications	Use of e-gas in targeted applications	Reducing energy demand via Energy Efficiency	Higherrecycling rates, material substitution, circularmeasures	Combination of most Cost- efficient options from "well below 2°C" scenarios with targeted application (excluding CIRC)		CIRC+COMBO but stronger
Buildings	Increased deployment of heat pumps	Deployment of H2 for heating	Deployment of e-gas for heating	Increased renovation rates and depth	Sustainable buildings		COMBO but stronger	CIRC+COMBO but stronger
Transport sector	Faster electrification for all transport modes	H2 deployment for HDVs and some for LDVs	E-fuels deployment for all modes	Increased modal shift	Mobility as a service			<ul> <li>CIRC+COMBO but stronger</li> <li>Alternatives to air travel</li> </ul>
Other Drivers		H2 in gas distribution grid	E-gas in gas distribution grid				Limited enhancement natural sink	<ul> <li>Dietary changes</li> <li>Enhancement natural sink</li> </ul>

(出所) European Commission (2018) In-depth Analysis in Support of the Commission Communication COM (2018)

#### The road to a net-zero greenhouse gas economy

#### • joint action along a set of seven main strategic building blocks

Seven main strategic building blocks	Examples of actions	
1. Maximise the benefits from Energy Efficiency including zero emission buildings	<ul> <li>● デジタル化、ホームオートメーション、ラベリング、効率基準の設定、リノベーション率の向上、暖房 用燃料の再エネへの燃料転換、最高効率の製品・機器、スマートビルディング、家電機器管理 システム、断熱材の改良</li> </ul>	
2. Maximise the deployment of renewables and the use of electricity to fully decarbonise Europe's energy supply	<ul> <li>● 電化の推進、再エネ発電のシェア拡大、電力や電力起源燃料の暖房・輸送・産業での利用、 CO2の原料利用、エネルギー貯蔵の大規模展開、デジタル化による管理、サイバー攻撃からの 保護</li> </ul>	
3. Embrace clean, safe and connected mobility	<ul> <li>・ 脱炭素・分散・デジタル化された電力、高効率で持続性の高いバッテリー、高効率の動力伝達系、コネクテッド、自動運転、バイオ燃料、電力起源燃料、海上輸送・内陸水路の活用</li> <li>・ 都市計画、サイクリング・徒歩、ドローン等の新技術、シェアリングサービス、テレビ会議</li> </ul>	
4. A competitive EU industry and the circular economy as a key enabler to reduce greenhouse gas emissions	<ul> <li>● リユース・リサイクル、エネルギー集約材の代替材、既存設備の近代化・完全置換、デジタル化・ 自動化、電化・水素・バイオマス・合成ガス、CO2の回収・貯蔵・利用、水素・バイオマスの原料 利用</li> <li>● 再利用と追加サービスを核とした新たなビジネス</li> </ul>	
5. Develop an adequate smart network infrastructure and inter-connections	<ul> <li>● 国境を越えた地域協力・部門統合</li> <li>● スマートな電力・情報網、水素インフラ整備、スマートな充電・給油所を備えた輸送システム</li> </ul>	
6. Reap the full benefits of bio-economy and create essential carbon sinks	<ul> <li>● デジタル化とスマート技術による精密農業、嫌気性消化槽による肥料処理、農地の炭素貯留</li> <li>● 劣化した森林・生態系の再生、水生生物資源の生産性改善</li> </ul>	
7. Tackle remaining CO2 emissions with carbon capture and storage	● 研究開発の拡大、CO2輸送・貯留ネットワークの建設、世論の懸念への対応	

(出所) European Commission (2018)「Communication from the Commission to the European Parliament, The European Council, The Council, The European Economic and Social Committee, The Committee of The Regions and The European Investment Bank」より作成

# Perspectives and challenges for carbon neutrality by 2050 (3)

- Challenges for policies to develop new technologies: How to address uncertainty surrounding cost and feasibility?
  - Policy should clearly indicate necessity for new emission reduction technologies and potential for marketization.
    - Stipulation of clear and consistent policy direction for decarbonization such as carbon neutrality by 2050, Green Growth Strategy...
  - Necessary for policies and measures throughout lifecycle of a technology (innovation process) not only R & D



- Policies and measures to raise demand for and to create market of lower carbon products and services
  - Policies and measures to make carbon (reduction) value visible to users and consumers
  - Carbon pricing is one of the options.
- Building infrastructure for new technologies
  - Including institutional infrastructure enhancing innovation, such as new standards and QC scheme, regulatory measures
- Promoting financial flow and investment for new technologies
  - Including policies and measures to make corporate value visible to investors

## Cost of CCS

 火力発電に対して、足下のCCSコストによる価格上昇は石炭火力:約7~9円/kWh、ガス火力:約3~ 4円/kWh。



## Cost of power generation by hydrogen and by ammonia

水素発電(2020年時点試算)

アンモニア発電(2018年時点試算)



### Thank you for your attention!

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