SUSTAINABLE FINANCE PROGRAMME

SMITH SCHOOL OF ENTERPRISE AND THE ENVIRONMENT

UNIVERSITY OF OXFORD

Stranded Assets and Thermal Coal in Japan: An Analysis of Environment-related Risk Exposure

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STRANDED ASSETS AND ENVIRONMENT-RELATED RISK

Stranded Assets are 'assets that have suffered from unanticipated or premature write-downs, devaluations or conversion to liabilities'.

Changing resource landscapes

Shale gas abundance, water scarcity, phosphate availability

Falling clean technology costs

Massive cost reductions in renewables and battery technology. Impressive cost curves and learning rates supported by small-scale modular approaches

Government regulation

Introduction and ratchet of carbon pricing, air pollution regulation, product standards, remediation requirements

Environmental Change

Physical climate change, drought, flooding, storm events, biodiversity loss

Evolving social norms

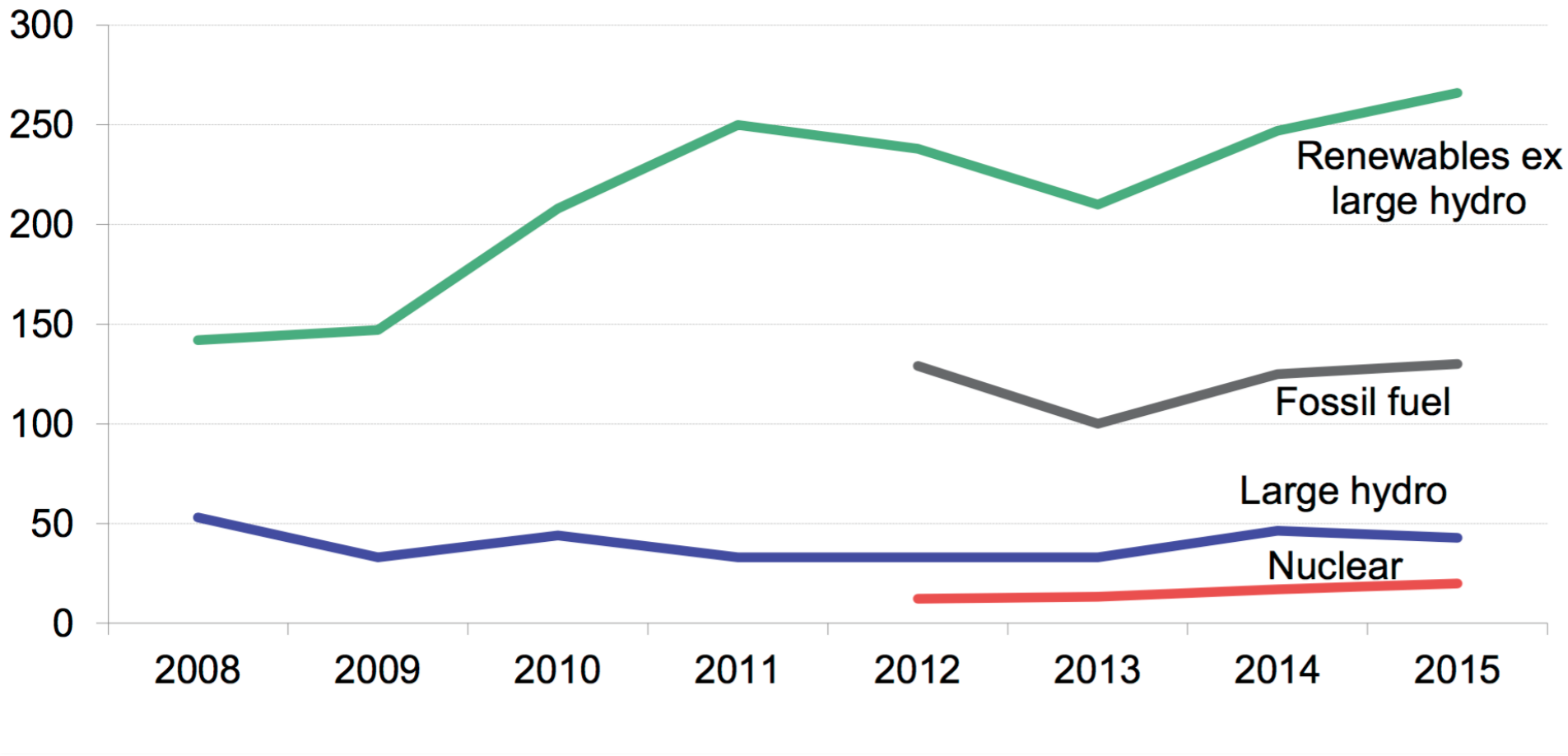
From fossil fuel divestment through to consumer preferences for provenance standards, Fairtrade, and organic

Litigation and changing statutory interpretations

Causing harm, failing to manage risk, and failing to disclose appropriately open company directors and other fiduciaries to legal challenges. Changes in law exacerbate risk.

- **SYSTEMIC/CORRELATIONS**
- **MISPRICED/IGNORED**
- **INTERDISCIPLINARY, NON-LINEAR, LACK TRACK RECORD**
- **CURRENT, NOT DISTANT**

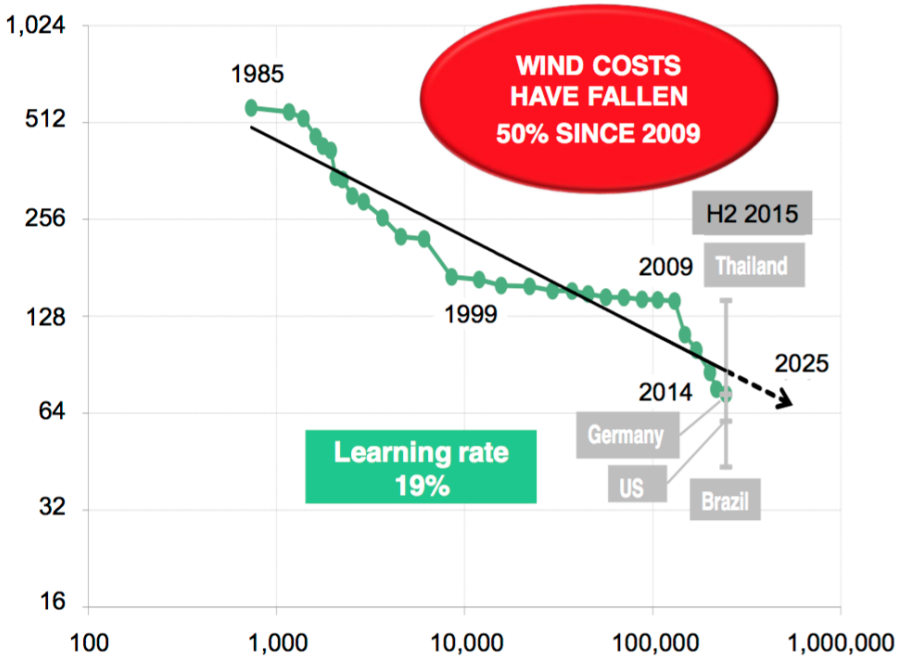
INVESTMENT IN POWER CAPACITY, 2008–15 ($BN)



Source: Bloomberg NEF (2016)

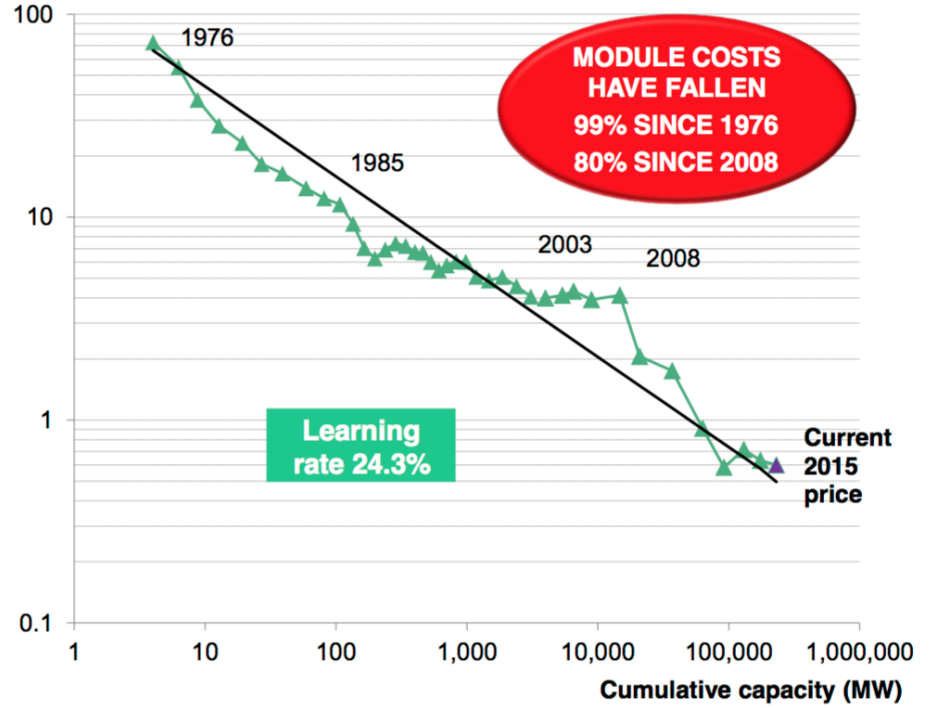
WIND AND SOLAR EXPERIENCE CURVES

ONSHORE WIND LEVELISED COST ($/MWh)



Note: Pricing data has been inflation corrected to 2014. We assume the debt ratio of 70%, cost of debt (bps to LIBOR) of 175, cost of equity of 8% Source: Bloomberg New Energy Finance

SOLAR PV MODULE COST ($/W)



Note: Prices are in real (2015) USD. 'Current price' is $0.61/W Source: Bloomberg New Energy Finance, Maycock

Source: Bloomberg NEF (2016)

CONSENSUS ENERGY FORCASTS VS REALITY

Chart 1: CAGR of total energy demand, 2014-40

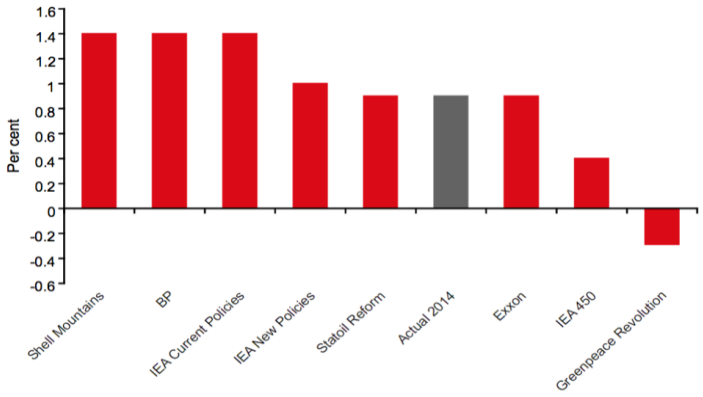


Chart 2: CAGR of solar and wind supply, 2014-40

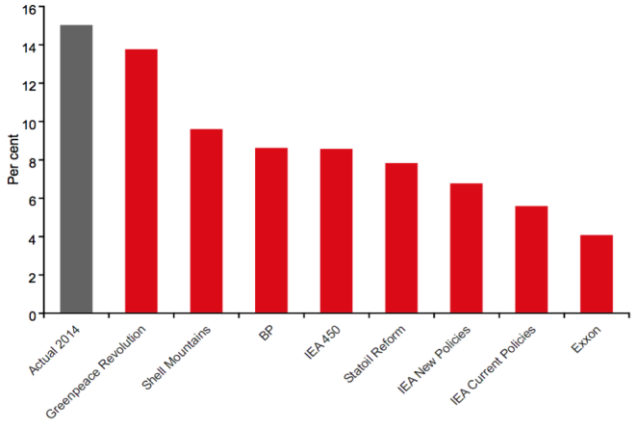


Chart 4: CAGR of fossil fuel supply, 2014-40

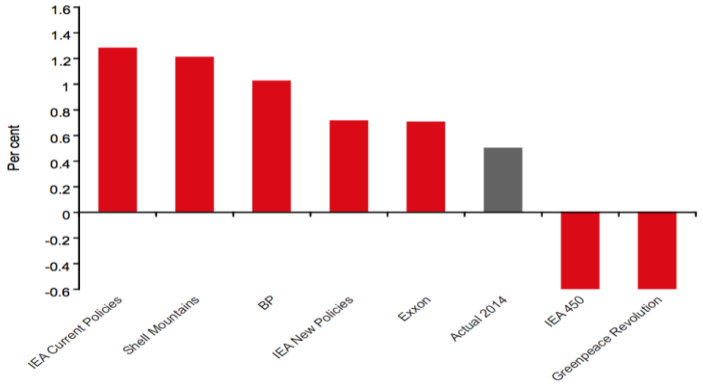
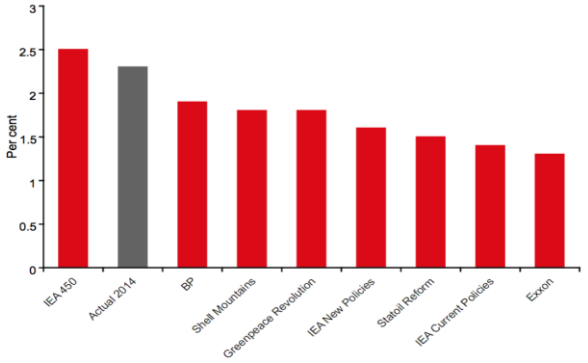


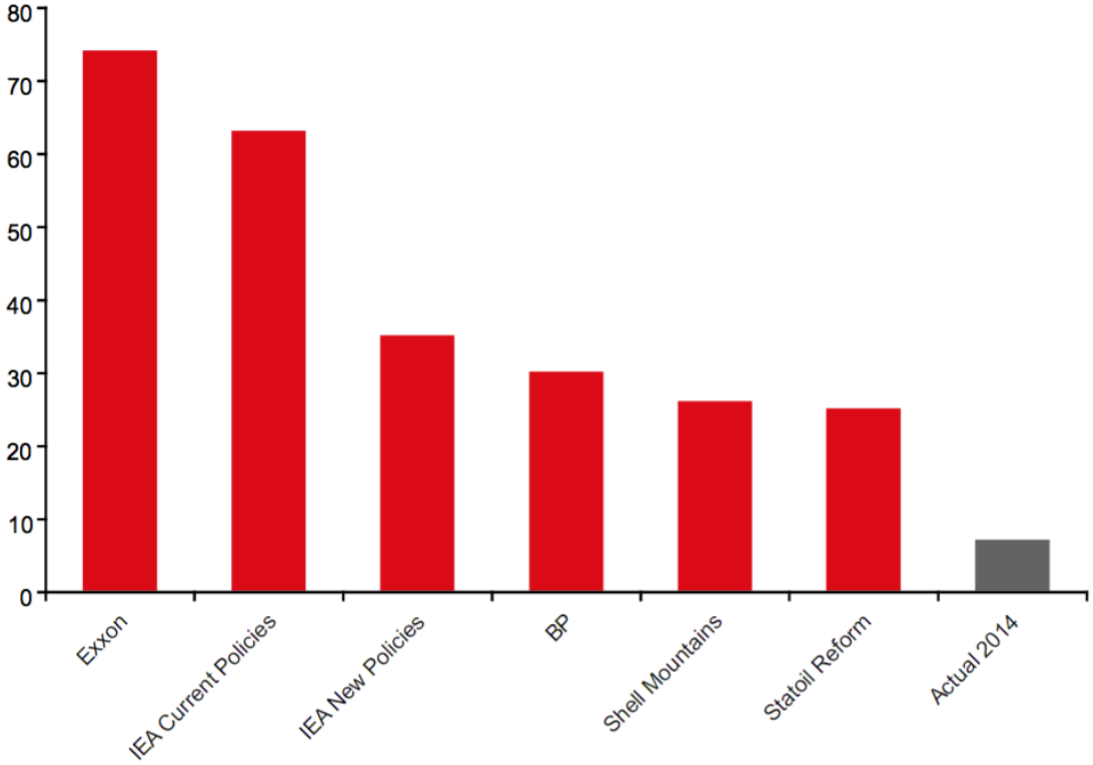
Chart 3: CAGR of Nuclear, hydro and biomass supply, 2014-40



Source: Trusted Sources UK Ltd (2016)

YEARS UNTIL TIPPING POINT

'The point at which renewables make up all of the increase in global energy supply and fossil fuel supply starts to fall.'



Source: Trusted Sources UK Ltd (2016)

EXPOSURE AND WHY IT MATTERS

How is environmental risk and opportunity embedded throughout the investment chain and what are the data requirements of different stakeholders?

ASSETS

EXPOSED TO DIFFERENT ENVIRONMENTAL RISKS AND OPPORTUNITIES

COMPANIES

OWN EXPOSED ASSETS

ASSET MANAGERS

OWN COMPANY DEBT AND EQUITY

ASSET OWNERS

ALLOCATE CAPITAL TO ASSET MANAGERS OR ACT AS ASSET MANAGERS THEMSELVES

POLICYMAKERS AND REGULATORS

MANAGE MICROPRUDENTIAL RISK, SYSTEMIC RISK, ECONOMIC GROWTH, AND WANT TO IMPLEMENT NDCs SUCCESSFULLY

CURRENT EFFORTS TO MEASURE EXPOSURE ARE DEEPLY FLAWED

Carbon foot printing is not a solution, but current efforts focus on incremental improvements to a questionable approach

- PHYSICAL CLIMATE CHANGE IMPACTS
- INCREASING STRINGENCY OF ENVIRONMENTAL REGULATION
- COMPETITION FROM CLEAN TECH
- INCREASED REPUTATIONAL RISK

- CARBON INTENSITY DATA USED AS A ‘TOP DOWN’ PROXY
- UNREPORTED DATA CALCULATED BY THIRD PARTIES USING NON-TRANSPARENT BLACK BOXES
- FAILS TO CONVINCE MAINSTREAM

HYPOTHESES NEED TO BE DEFINED AND THEN MEASURED 'BOTTOM UP'

How should exposure to environmental risk and opportunity be measured?

PHYSICAL CLIMATE CHANGE IMPACTS

INCREASING STRINGENCY OF ENVIRONMENTAL REGULATION

COMPETITION FROM CLEAN TECH

INCREASED REPUTATIONAL RISK

HEAT STRESS PROJECTIONS

FLOODING PROJECTIONS

PRECIPITATION PROJECTIONS

ASSETS PARTICULARLY EXPOSED

PRICING OF EXTERNALITIES

ASSETS IN JURISDICTIONS PARTICULALRY AT RISK

PACE OF DEPLOYMENT IN KEY MARKETS

UTILISATION RATES

POLICY SUPPORT

ASSETS IN PROXIMITY TO NATIONAL PARKS

SALIENCE OF AREAS AFFECTED

SOCIAL MEDIA

PROJECT: STRANDED ASSETS AND THERMAL COAL IN JAPAN

- 55 coal-fired power utilities in Japan with 47.8GW of operating coal-fired generating capacity
- 5 coal-fired power stations under construction with 1.9GW capacity
- 49 coal-fired power stations in planning with 28GW capacity

	TOP 10 COMPANIES	COAL GENERATION [GWh]	COAL-FIRED CAPACITY		
			OPR [MW]	CON [MW]	PLN [MW]
1	J-POWER	60,352	8,414	84	4,020
2	TOHOKU ELECTRIC POWER CO	36,273	4,901	-	600
3	CHUBU ELECTRIC POWER CO INC	30,610	4,100	-	2,030
4	TOKYO ELECTRIC POWER CO	25,360	5,900	540	5,357
5	CHUGOKU ELECTRIC POWER CO	23,106	4,208	84	1,445
6	HOKURIKU ELECTRIC POWER CO	18,492	2,903	-	-
7	KYUSHU ELECTRIC POWER CO	17,231	3,646	1,000	667
8	HOKKAIDO ELECTRIC POWER CO INC	15,868	2,500	-	-
9	KOBE STEEL LTD	8,753	1,475	-	1,300
10	SUMITOMO CORP	7,994	1,395	-	-

CONTEXT

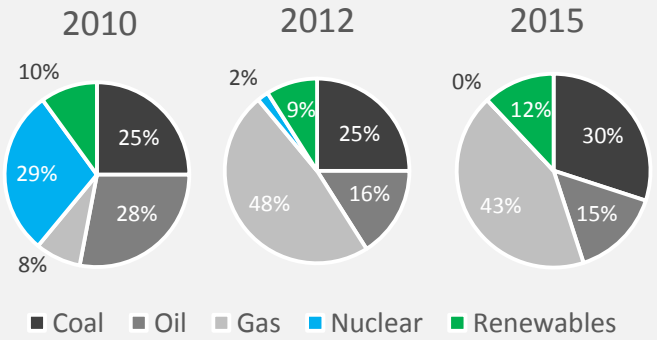
STRANDED ASSETS AND THERMAL COAL IN JAPAN

- Tohoku earthquake and associated Fukushima Daiichi nuclear accident caused massive changes to energy policy development, the shutdown of all nuclear power stations, and a re-carbonisation of Japan's electricity grid
- Recarbonisation was accompanied by massive build-out of small-scale solar PV, leading to 'death spiral' conditions for Japan's utilities
- Restarting of Japan's nuclear fleet is highly uncertain, with public opinion strongly opposed and stringent new safety requirements

Table 1: Replacement of Retiring Capacity by Fuel Type

[GW]	'Retiring Capacity' through 2026, estimate	Under Construction and Planned Capacity, actual	Replacement Ratio
Coal	10.3	30.0	291%
Gas	37.1	37.1	100%

Figure 5: Change in Japan Generation Mix



ASSET-LEVEL DATABASES

STRANDED ASSETS AND THERMAL COAL IN JAPAN

Table 56: Data sources and completeness

Data	Data Source	Completion %	Notes
Number of Coal-Fired Generating Assets (N = 154 coal-fired power stations)			
Location	CoalSwarm, Q4 2015; Enipedia; CARMA, v3.0 released Jul 2012; Platts' WEPP, Q1 2016	100%	
Capacity [MW]	CoalSwarm, WEPP, Enipedia, CARMA	100%	
Generation [MWh]	Enipedia, CARMA, Oxford Smith School	100%	48% estimated
Plant Age	CoalSwarm, WEPP, Enipedia, CARMA, Oxford Smith School	100%	4% estimated
CO_2 Intensity	CoalSwarm, WEPP, CARMA, Oxford Smith School	100%	3% estimated
Market Analysis			
General Information	S&P CapitalIQ, Trucost	-	
Capital Spending Trends	S&P CapitalIQ	-	
Bond Issuances	S&P CapitalIQ	-	
Ownership Trends	S&P CapitalIQ	-	
Local Risk Hypotheses			
$PM_{2.5}$ Emissions 2012-2014 Average	Atmospheric Composition Analysis Group, Dalhousie University	Global	
NO_2 Emissions 2015	NASA GES DISC OMNO2	Global	
Mercury Emissions 2010	AMAP/UNEP 2010	Global	
Water Stress 2015	WRI Aqueduct	Global	
CCS Geologic Suitability	Geogreen	Global	
Heat Stress Change 2016-2035	IPCC AR5 WGII	Global	
Nuclear Restart Risk	WEPP	Global	
National Risk Hypotheses			
Renewables Outlook	EY Renewable Energy Country Attractiveness Index	See NRHs for details	
Renewables Policy	REN21 Global Status Report	See NRHs for details	
Water Regulatory Risk 2015	WRI Aqueduct	See NRHs for details	
CCS Legal Environment	Global CCS Institute Legal and Regulatory Indicator	See NRHs for details	

RISK HYPOTHESES (LOCAL AND NATIONAL)

STRANDED ASSETS AND THERMAL COAL IN JAPAN

Table 2: Local Risk Hypotheses (LRHs) and National Risk Hypotheses (NRHs)

#	NAME	SOURCE
Coal-Fired Power Utilities		
LRH-1	Carbon Intensity	CARMA/CoalSwarm/Oxford Smith School
LRH-2	Plant Age	CARMA/CoalSwarm/WEPP
LRH-3	Local Air Pollution	Boys et al. (2015)/NASA's SEDAC
LRH-4	Water Stress	WRI's Aqueduct
LRH-5	CCS Retrofitability	CARMA/CoalSwarm/WEPP/Geogreen
LRH-6	Future Heat Stress	IPCC AR5
LRH-7	Nuclear Restart Risk	CoalSwarm/WEPP
NRH-1	Future Electricity Demand	Oxford Smith School
NRH-2	Renewables Resource	Oxford Smith School
NRH-3	Renewables Policy Support	EY's Renewables Attractiveness Index
NRH-4	Decentralised Renewables and the 'Utility Death Spiral'	Oxford Smith School
NRH-5	Growth of Utility-Scale Renewables Generation	BP/REN21
NRH-6	Growth of Gas-Fired Generation	IEA
NRH-7	Falling Utilisation Rates	Oxford Smith School
NRH-8	Regulatory Water Stress	WRI's Aqueduct
NRH-9	CCS Legal Environment	Global CCS Institute
NRH-10	Nuclear Restarts	Oxford Smith School

FINDINGS: NATIONAL RISK HYPOTHESES

STRANDED ASSETS AND THERMAL COAL IN JAPAN

Table 5: Summary of National Risk Hypotheses

	Japan	Australia	China	Germany	Indonesia	India	Poland	South Africa	United Kingdom	United States
NRH-1: Future Electricity Demand	🔴	🟡	🟢	🔴	🟢	🟢	🔴	🟡	🔴	🟡
NRH-2: Renewables Resource	🟢	🔴	🟢	🟢	🟡	🟡	🟡	🔴	🟡	🟡
NRH-3: Renewables Policy Support	🔴	🟡	🔴	🔴	🟢	🔴	🟢	🟡	🟡	🔴
NRH-4: Growth of Decentralised Renewables	🔴					N/A				
NRH-5: Growth of Utility-Scale Renewables	🟢					N/A				
NRH-6: Growth of Gas-Fired Power	🟡	🟡	🔴	🟢	🔴	🟡	🟢	🟢	🟢	🔴
NRH-7: Falling Utilisation Rates	🟡	🟡	🔴	🟢	🟡	🔴	🟡	🔴	🟡	🟡
NRH-8: Regulatory Water Stress	🟢	🟢	🟡	🟢	🔴	🟡	🟢	🟡	🟢	🟢
NRH-9: CCS Regulatory Env.	🟡	🟢	🔴	🟡	🔴	🔴	🟡	🔴	🟢	🟢
NRH-10: Nuclear Restarts	🟡					N/A				
TOTAL*	50%	60%	60%	50%	40%	45%	40%	55%	45%	60%

*Total for Japan based on this publication; total for comparator countries based on *Stranded Assets and Thermal Coal*

FINDINGS: LOCAL RISK HYPOTHESES, OPERATING PLANTS

STRANDED ASSETS AND THERMAL COAL IN JAPAN

	LRH-1: CARBON INTENSITY
1	CHUBU ELECTRIC POWER CO INC
1	HOKURIKU ELECTRIC POWER CO
1	MIIKE THERMAL POWER CO
1	OKINAWA ELECTRIC POWER CO
1	TOSHIBA CORP
6	J-POWER
6	MAZDA
8	JFE STEEL CORP
9	TOKUYAMA CORP
10	TOKYO GAS

	LRH-2: PLANT AGE
1	KASHIMA-KITA ELEC POWER CORP
1	CHUBU ELECTRIC POWER CO INC
1	TOSHIBA CORP
1	NIPPON MINING HOLDINGS CO LTD
1	CHUETSU PULP INDUSTRY CO LTD
6	OSAKA GAS CO LTD
6	TOHOKU ELECTRIC POWER CO
8	CHUGOKU ELECTRIC POWER CO
9	MIIKE THERMAL POWER CO
10	JFE STEEL CORP

	LRH-3: LOCAL AIR POLLUTION
1	KASHIMA-KITA ELEC POWER CORP
2	JFE STEEL CORP
3	MAZDA
4	NIPPON MINING HOLDINGS CO LTD
5	TOKAI KYODO ELEC POWER CO
6	KURARAY COMPANY LTD
7	J-POWER
8	CHUGOKU ELECTRIC POWER CO
9	SUMITOMO CORP
10	HOKURIKU ELECTRIC POWER CO

	LRH-4: WATER STRESS
1	CHUETSU PULP INDUSTRY CO LTD
2	SHOWA DENKO KK
3	J-POWER
4	TAIHEIYO CEMENT CORP
5	MIIKE THERMAL POWER CO
5	TOSHIBA CORP
5	DAICEL CHEMICAL INDUSTRIES CO
8	ITOCHU ENEX CO LTD
9	OJI PAPER CO LTD
9	TOKYO ELECTRIC POWER CO
9	KYUSHU ELECTRIC POWER CO

	LRH-5: CCS RETROFITABILITY
1	TOP 24 COMPANIES TIED

	LRH-6: FUTURE HEAT STRESS
1	KANSAI ELECTRIC POWER CO
2	KOBE STEEL LTD
2	CHUBU ELECTRIC POWER CO INC
4	OSAKA GAS CO LTD
5	HOKUREN NOKYO RENGOKAI
6	ASAHI KASEI GROUP
7	HOKURIKU ELECTRIC POWER CO
8	TOSOH CORP
9	KYUSHU ELECTRIC POWER CO
9	OKINAWA ELECTRIC POWER CO
9	SHIKOKU ELECTRIC POWER CO
9	TAIHEIYO CEMENT CORP

	LRH-7: REGIONAL NUCLEAR RESTARTS
1	ASAHI KASEI GROUP
1	HOKURIKU ELECTRIC POWER CO
3	HOKUREN NOKYO RENGOKAI
4	OSAKA GAS CO LTD
5	TOSOH CORP
6	TOKYO GAS
7	NIPPON MINING HOLDINGS CO LTD
7	MAZDA
7	JFE STEEL CORP
7	KASHIMA-KITA ELEC POWER CORP
7	TOKAI KYODO ELEC POWER CO
7	TOKUYAMA CORP

FINDINGS: LOCAL RISK HYPOTHESES, PLANNED PLANTS

STRANDED ASSETS AND THERMAL COAL IN JAPAN

	LRH-1: CARBON INTENSITY
1	SHIKOKU ELECTRIC POWER CO
2	ASAHI KASEI GROUP
3	KYUSHU ELECTRIC POWER CO
3	IDEMITSU KOSAN CO LTD
3	AIR WATER INC.
6	OSAKA GAS CO LTD
7	KOBE STEEL LTD
7	UBE INDUSTRIES
9	NIPPON PAPER INDUSTRIES CO LTD
10	TOKYO GAS

	LRH-2: PLANT AGE
1	CHIBA PREFECTURE
2	CHUBU ELECTRIC POWER CO INC
3	TONEN GENERAL SEKIYU
4	UBE INDUSTRIES
4	MARUBENI CORP
4	KANSAI ELECTRIC POWER CO
7	OSAKA GAS CO LTD
8	SHIKOKU ELECTRIC POWER CO
8	KOBE STEEL LTD
8	MAEDA CORPORATION
8	CHUGOKU ELECTRIC POWER CO
8	TOHOKU ELECTRIC POWER CO

	LRH-3: LOCAL AIR POLLUTION
1	ASAHI KASEI GROUP
1	TEIJIN LTD
1	SHOWA DENKO KK
4	SHIKOKU ELECTRIC POWER CO
4	KOBE STEEL LTD
4	TOHOKU ELECTRIC POWER CO
7	MAEDA CORPORATION
7	ORIX CORP
9	CHUBU ELECTRIC POWER CO INC
9	ABL CO LTD.
9	NIPPON PAPER INDUSTRIES CO LTD

	LRH-4: WATER STRESS
1	NIPPON PAPER INDUSTRIES CO LTD
2	SHOWA DENKO KK
3	KOBE STEEL LTD
4	CHUBU ELECTRIC POWER CO INC
5	J-POWER
6	TEIJIN LTD
7	TOHOKU ELECTRIC POWER CO
8	TOKYO ELECTRIC POWER CO
9	MAEDA CORPORATION
10	KANSAI ELECTRIC POWER CO

	LRH-5: CCS RETROFITABILITY
1	TOP 15 COMPANIES TIED

	LRH-6: FUTURE HEAT STRESS
1	IDI INFRASTRUCTURES F-POWER
2	TOHOKU ELECTRIC POWER CO
3	MAEDA CORPORATION
3	NIPPON PAPER INDUSTRIES CO LTD
5	SHOWA DENKO KK
6	ASAHI KASEI GROUP
7	TEIJIN LTD
7	ABL CO LTD.
7	SHIKOKU ELECTRIC POWER CO
10	KOBE STEEL LTD

	LRH-7: REGIONAL NUCLEAR RESTARTS
1	TOHOKU ELECTRIC POWER CO
1	MAEDA CORPORATION
1	ABL CO LTD.
1	JOBAN JOINT POWER CO
5	MARUBENI CORP
6	NIPPON PAPER INDUSTRIES CO LTD
7	MITSUBISHI CORP
8	ORIX CORP
9	TOKYO ELECTRIC POWER CO
10	CHUBU ELECTRIC POWER CO INC

POTENTIAL SCALE OF STRANDED ASSETS

STRANDED ASSETS AND THERMAL COAL IN JAPAN

METHODOLOGY

- Calculated at the asset-level. Delineate into existing- and planned-capacity (WEPP, 2016)

- We identify the year coal-fired capacity entered, or plans to enter, commercial operations:
  - Estimate total build cost at ~¥250,000,000/MW at inception (Rong and Victor, 2012)
  - Depreciate the asset over an expected 40 year useful life (Pfeiffer et al, 2016).

- We assume three pathways to removing coal-fired generation
  - 5 years, 10 years, and 15 years.

- Calculate potential **unrecoverable costs** in the case of mothballing or early decommissioning in each of the three scenarios, across existing and new-build generation (Caldecott & McDaniels, 2014). **Unrecoverable costs =** residual asset value after depreciation.

- Three periods selected to reflect different speeds and scales at which the risk factors identified could realistically materialise. While highly illustrative, they highlight the potential impact of stranded coal assets, particularly from coal-fired power plants that are planned, but not currently under construction.

POTENTIAL SCALE OF STRANDED ASSETS

STRANDED ASSETS AND THERMAL COAL IN JAPAN

Figure 35: *Potential stranded assets for existing and new build coal generators*

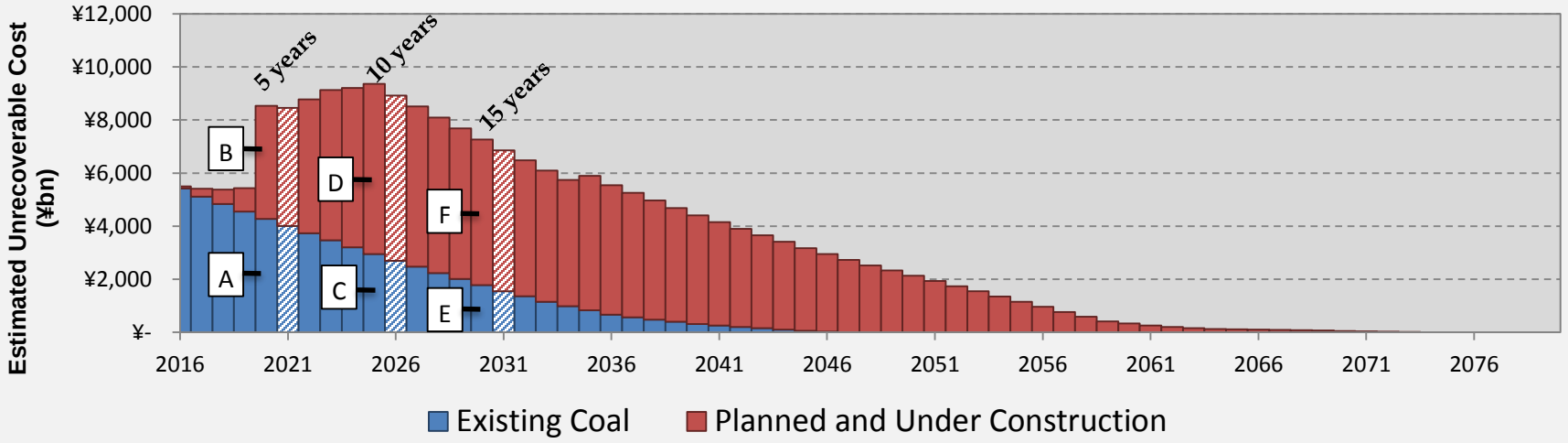


Table 43: Estimates of unrecoverable costs across three scenarios (¥bn/US$bn)

Coal Offline in:	Existing Assets	Planned and Under Construction	Total
2021 (5 years)	**[A]** ¥4,005 ($35.99)	**[B]** ¥4,447 ($39.96)	**[A + B]** ¥8,453 ($75.96)
2026 (10 years)	**[C]** ¥2,700 ($24.26)	**[D]** ¥6,223 ($55.92)	**[C+ D]** ¥8,924 ($80.19)
2031 (15 years)	**[E]** ¥1,550 ($13.93)	**[F]** ¥5,307 ($47.69)	**[E + F]** ¥6,857 ($61.62)

FINDINGS: POTENTIAL ASSET STRANDING

STRANDED ASSETS AND THERMAL COAL IN JAPAN

Table 8: Selected utility estimates of total potential asset stranding

	Ratio Analysis[i]				Env.-Related Risks[i]							Stranded Assets[ii]		
	DEBT / EQUITY	CURRENT RATIO	(EBITDA – CAPEX) / INTEREST	OPR / PLN[iii]	LRH-1	LRH-2	LRH-3	LRH-4	LRH-5	LRH-6	LRH-7	2021 (5 year)	20 26 (10 year)	2031 (15 year)
J-POWER	84%	56%	94%	**OPR**	40%	58%	88%	55%	32%	53%	53%	¥586.2 (23%)	¥406.3 (16%)	¥237.5 (9%)
				PLN	44%	44%	68%	88%	41%	56%	6%	¥608.2 (24%)	¥904.9 (35%)	¥773.3 (30%)
TEPCO	91%	47%	66%	**OPR**	32%	22%	22%	20%	100%	12%	95%	¥730.1 (5%)	¥541.0 (4%)	¥351.9 (3%)
				PLN	47%	44%	68%	79%	53%	65%	76%	¥1,309.3 (9%)	¥1,136.3 (8%)	¥963.3 (7%)
CHUBU EPCO	78%	87%	86%	**OPR**	42%	35%	60%	80%	15%	30%	65%	¥384.6 (7%)	¥253.2 (5%)	¥121.7 (2%)
				PLN	26%	6%	76%	91%	38%	68%	74%	¥114.1 (2%)	¥339.5 (6%)	¥290.4 (5%)
KYUSHU EPCO	100%	62%	ND	**OPR**	35%	58%	88%	15%	30%	17%	85%	¥248.2 (5%)	¥145.7 (3%)	¥83.6 (2%)
				PLN	94%	62%	35%	50%	29%	15%	44%	¥406.0 (9%)	¥353.0 (8%)	¥299.2 (6%)
KANSAI EPCO	96%	98%	ND	**OPR**	20%	5%	30%	95%	15%	88%	12%	¥288.5 (4%)	¥230.8 (3%)	¥173.1 (2%)
				PLN	53%	18%	68%	74%	44%	59%	65%	¥439.2 (6%)	¥661.3 (9%)	¥566.4 (8%)

i) Ratio and environment-related risk presented as a percentile relative to Japan utility peer group, with a higher percentage indicating higher risk: $N_{D/E}$, $N_{Current\ Ratio}$ = 45; $N_{(EBITDA\text{-}CAPEX)/INT}$ = 35; N_{OPR} = 40; N_{PLN} = 34;
ii) Stranded Assets expressed in bn¥ and as a fraction of total utility assets
iii) OPR: Operating plants; PLN: Planned and under construction plants;

CONCLUSION

- FUTURE FOR JAPAN'S UTILITIES IS HIGHLY UNCERTAIN, PARTICULARLY FOR HEAVILY POLLUTING THERMAL GENERATORS SUCH AS COAL.
- PLANNED AND UNDER CONSTRUCTION COAL CAPACITY GREATLY EXCEEDS THAT REQUIRED TO REPLACE THE RETIRING FLEET - BY 191%. THIS MAY RESULT IN OVERCAPACITY AND COMBINED WITH COMPETITION FROM OTHER FORMS OF GENERATION CAPACITY WITH LOWER MARGINAL COSTS (E.G. NUCLEAR AND RENEWABLES), LEAD TO SIGNIFICANT ASSET STRANDING OF COAL GENERATION ASSETS.
- STRANDED COAL ASSETS COULD BE ¥6,857BN - ¥8,924BN ($61.6BN - $80.2BN), EQUIVALENT TO 22.6% - 29.4% OF THE CURRENT MARKET CAPITALIZATION, AND 4.5%-5.9% OF TOTAL ASSETS, OF JAPAN'S POWER UTILITIES. THIS HIGHLIGHTS THE RISKS OF CONTINUING TO PROCEED WITH THE PLANNING AND DEVELOPMENT OF NEW COAL-FIRED POWER PLANTS IN JAPAN.
- STRANDED COAL ASSETS WOULD AFFECT UTILITY RETURNS FOR INVESTORS; IMPAIR THE ABILITY OF UTILITIES TO SERVICE OUTSTANDING DEBT OBLIGATIONS; AND CREATE STRANDED ASSETS THAT HAVE TO BE ABSORBED BY TAXPAYERS AND RATEPAYERS.
- MOREOVER, NEW COAL-FIRED POWER STATIONS WILL GENERATE SIGNIFICANT NEGATIVE EXTERNALITIES FOR THE DURATION OF THEIR SHORTER THAN ANTICIPATED LIVES, PARTICULARLY IN TERMS OF CARBON EMISSIONS THAT CAUSE CLIMATE CHANGE, AS WELL AS AIR POLLUTION THAT HARMS HUMAN HEALTH.