

Arz Güvenliđi 3.0

Jeopolitik riskler ve teknolojik dönüşüm nereye götürür?

Bariş Sanlı
Enerji Danışmanı
22.02.2022

İsteyenler için

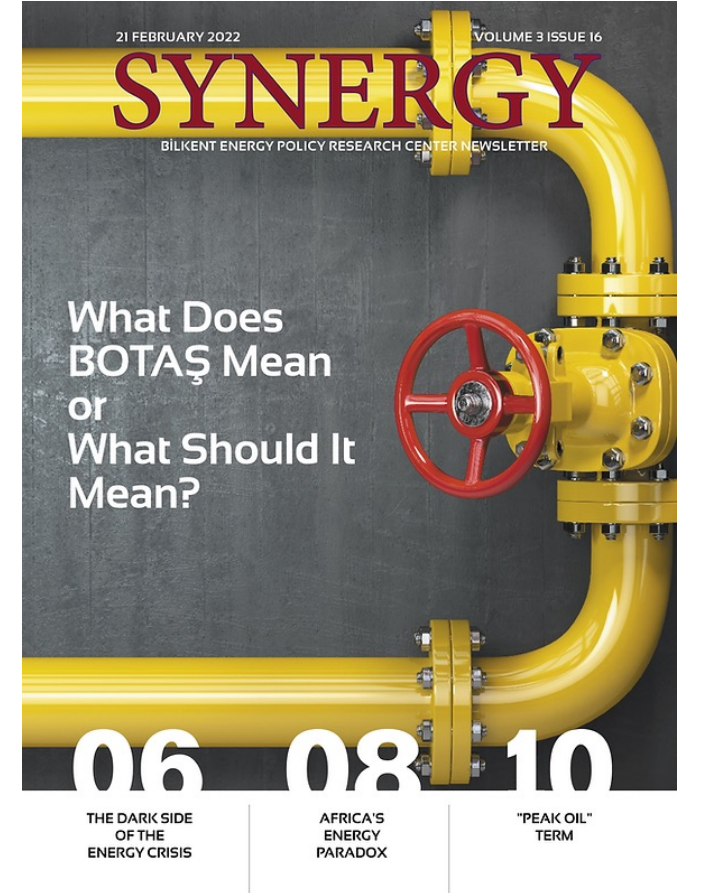


Energy
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SYNERGY

Bilkent Energy Policy Research Center Newsletter

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<https://www.bilkenteprc.com/synergy>

Önermeler

“Ön kabulleri sorgula”

“Tanımlayamadığın şeyi yönetemezsin”

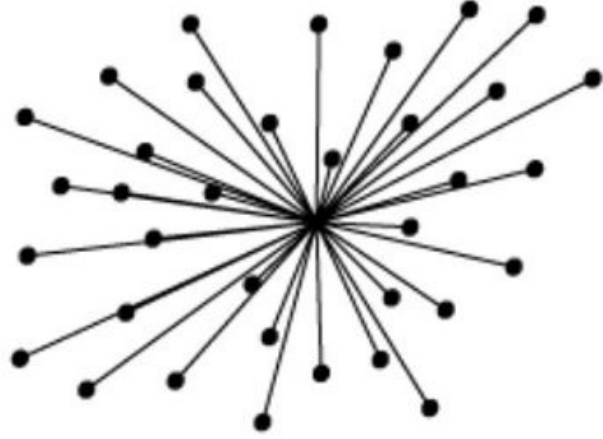
“Beklentiler değişecek ve kolay olmayacak”

Üç dönem

- Çeşitlendirme
 - Churchill “variety”, yerli kömürden ithal petrole geçiş
 - Sebep? Alman gemilerine göre hız (teknolojik üstünlük)
- Kurumsallaştırma
 - 7 Kız Kardeş? Avrupa Kömür ve Çelik Birliği? “Energy Union”
 - Çeşitlendirme farklı coğrafyaları da içine alıyor
 - “Hedge” mekanizması : Petrol stokları
- Öngörücülük – Olaylar olacak, sistem çökecek, optimizasyon anahtar
 - Siber, doğa vs artacak, ana kabul
 - Enerji sistemi daha çok doğanın etkilerinde (artan elektrikleme ve elektriğin doğal kaynaklardan artan oranda üretilmesi, dağıtık üretim)
 - Sistemin dinamik şekillenmesi, yapay zeka
 - 0-100 süresi, yani sistem kaldırma süresi yeni performans metriği



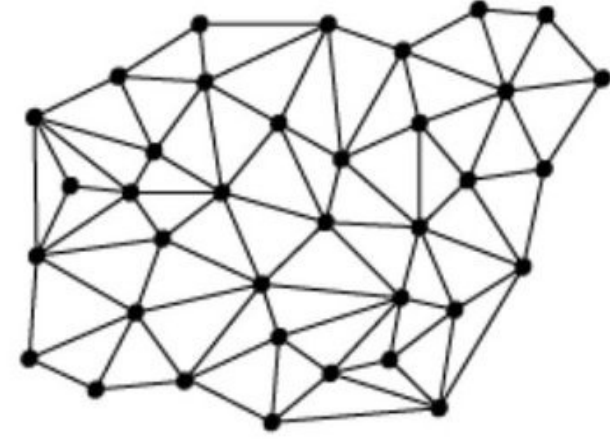
Neden riskler artıyor



centralised



decentralised



distributed

- Km hat +
- Tüketim +
- Kritiklik +
- Coğrafi dağılım +

- Doğa olaylarına maruz kalma +
- TR'de yükselti +

Neden riskler artıyor



Doğa



Kaynak



Doğa

Hava olayları – ABD’deki olaylar

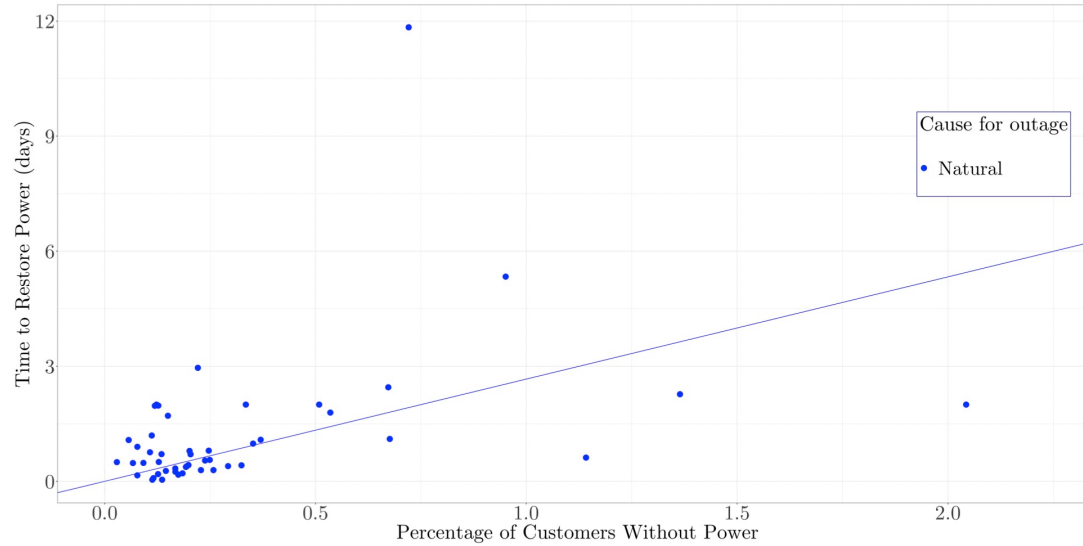
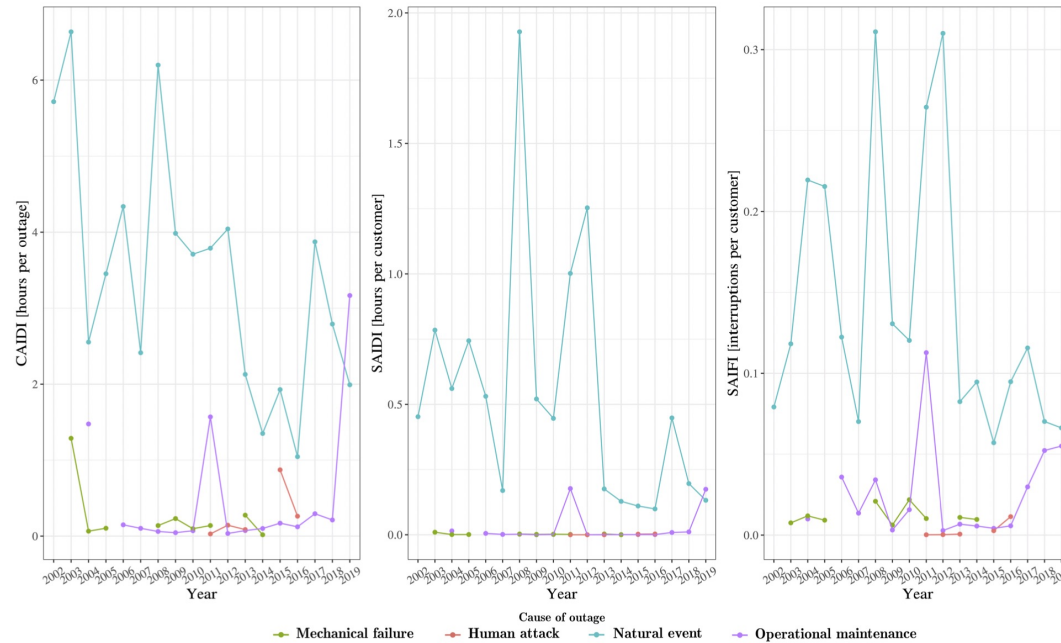


Figure 4: Natural hazard-induced power outage events with a regression line for the state of Alabama for 2002–2019.

CAIDI values per outage type for WECC 2002–2019

Reason for Outage	CAIDI
Human attack	0.0728
Mechanical failure	0.3296
Natural hazard	4.0848
Operations	1.2837



Number of outages by NERC region per type of cause

Cause	SERC	WECC
Human attack	11	80
Mechanical failure	11	17
Natural hazard	495	138
Operations	29	89
Total	546	324

IEEE 1366-2012 – Major Event Day

- TMED - Major Event Day Threshold

$$SAIDI = \frac{\sum \text{Customer Interruption Durations}}{\sum \text{Customers Served}} \quad (1)$$

$$T_{MED} = e^{(\alpha + 2.5\beta)} \quad (2)$$

Where for each utility:

α is the log-normal average of the previous five years of daily SAIDI

β is the log-normal standard deviation of the previous five years of daily SAIDI

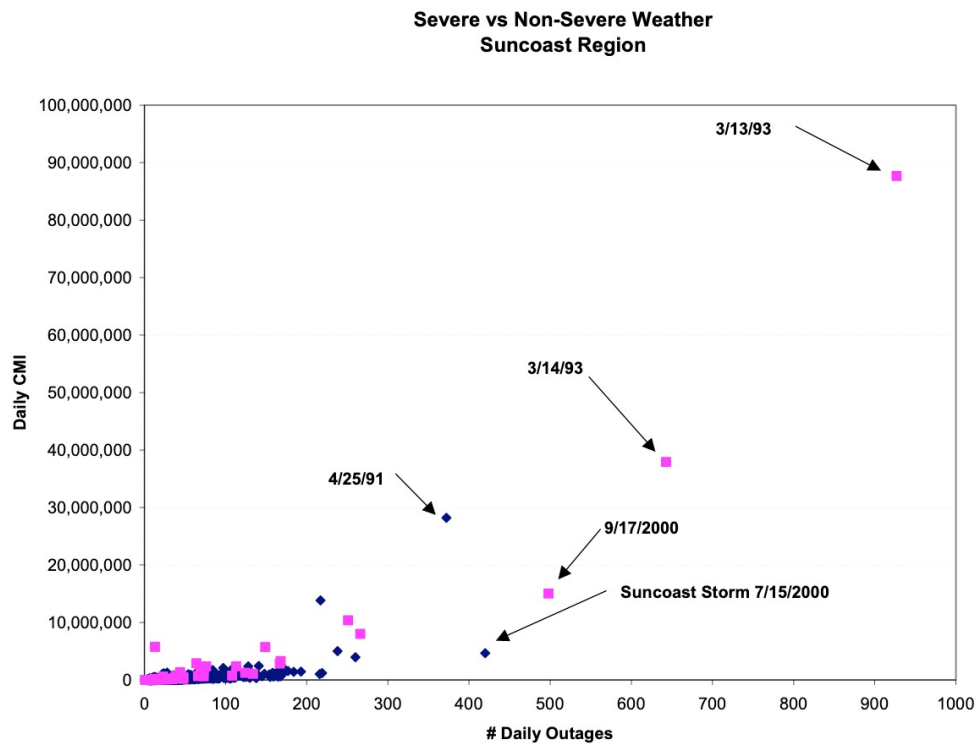
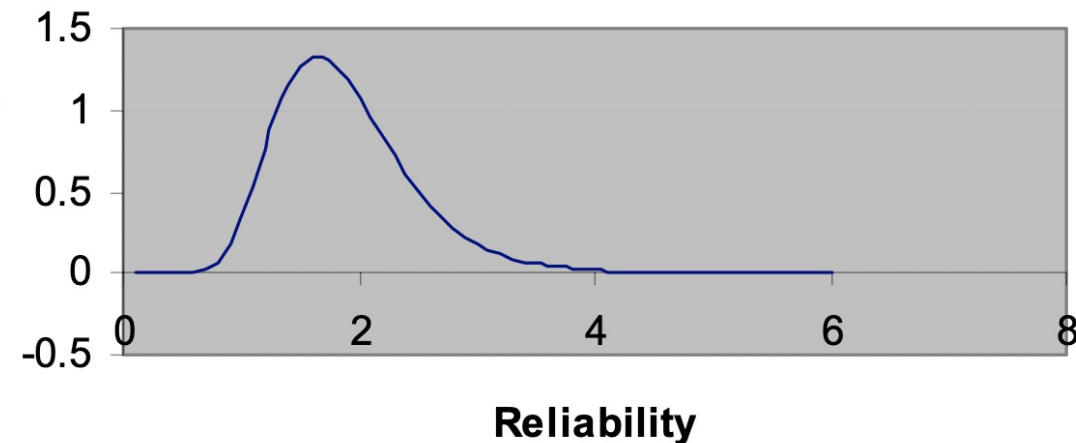


Fig. 4 - Typical Log-Normal Distribution

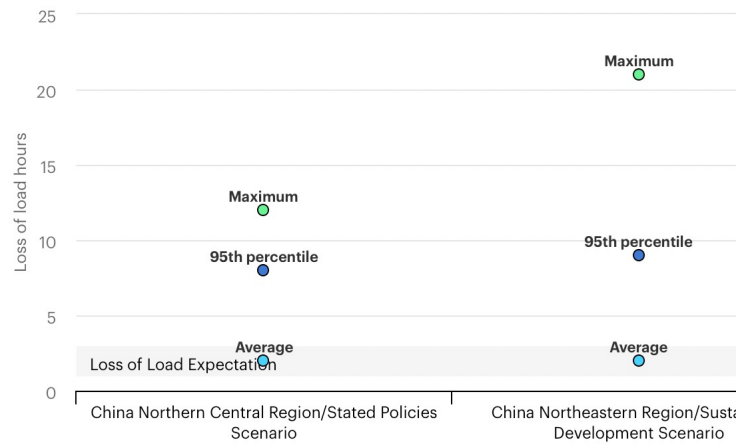


IEA

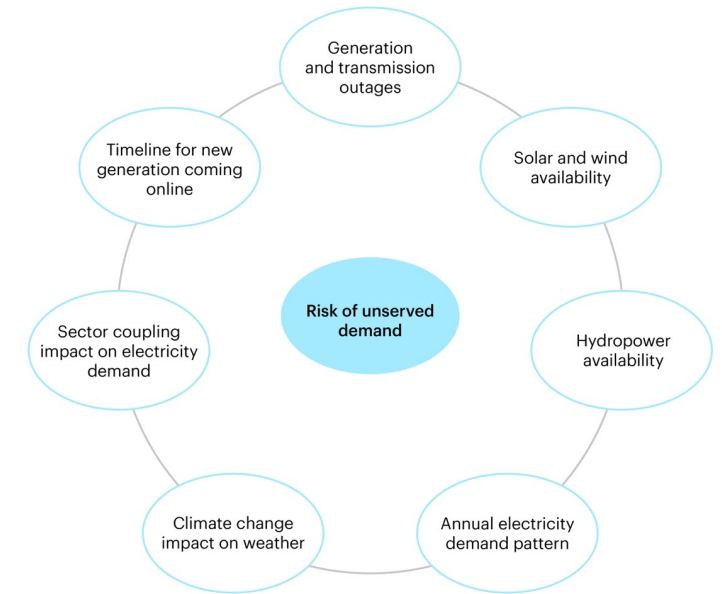
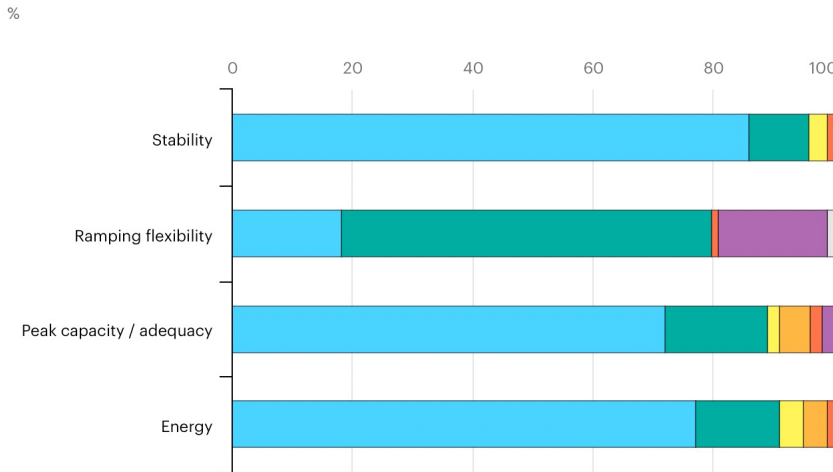
- Enerji Dönüşümü, Elektrik sistem planlamasında inovasyon gerektirir.

Key aspects of uncertainty that probabilistic modelling assessments can capture

Difference in reliability statistics for extreme events in regions with similar average statistics in China in the Stated Policies Scenario, 2035



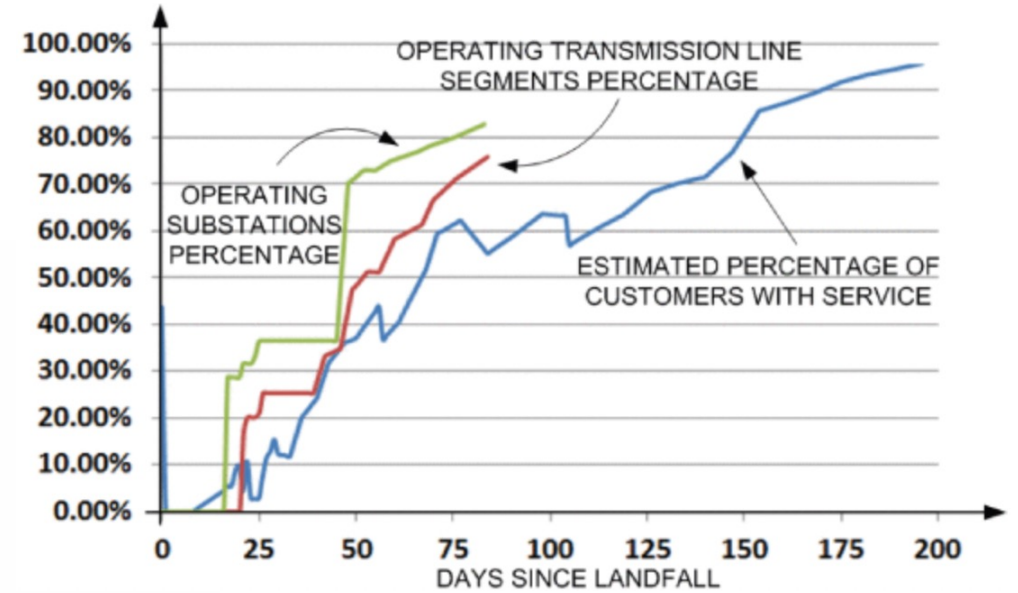
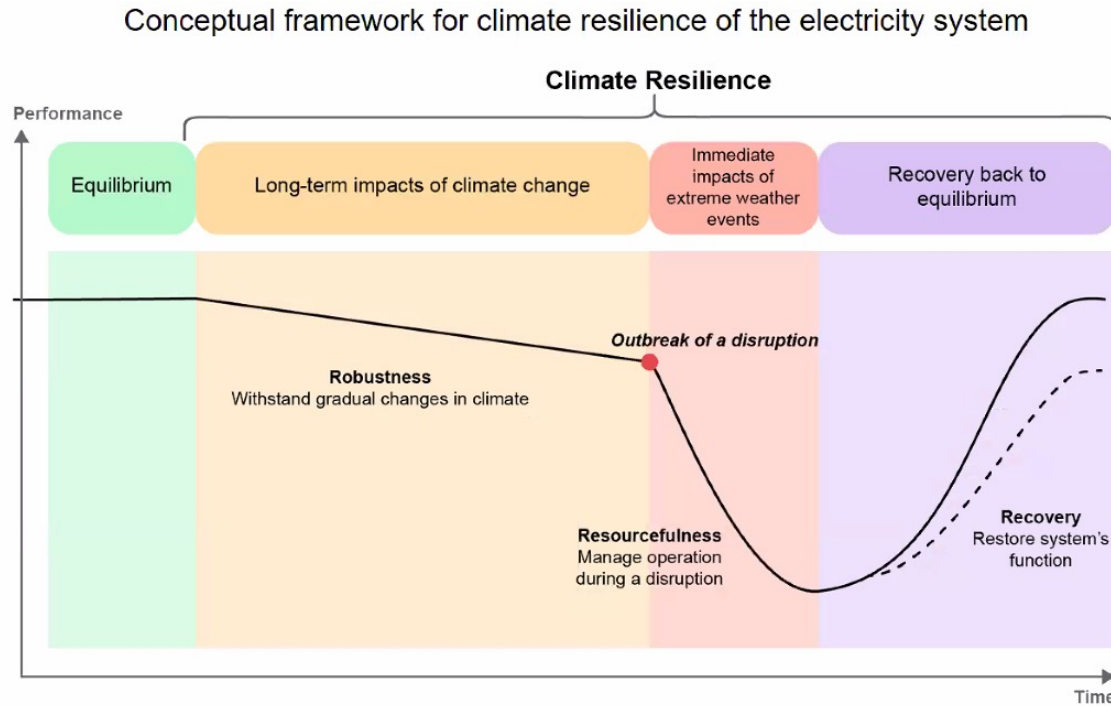
Energy and service contributions of different technologies to maintain electricity security in China, 2020



IEA. All

● Average ● 95th percentile ● Maximum

İklim güvenliği



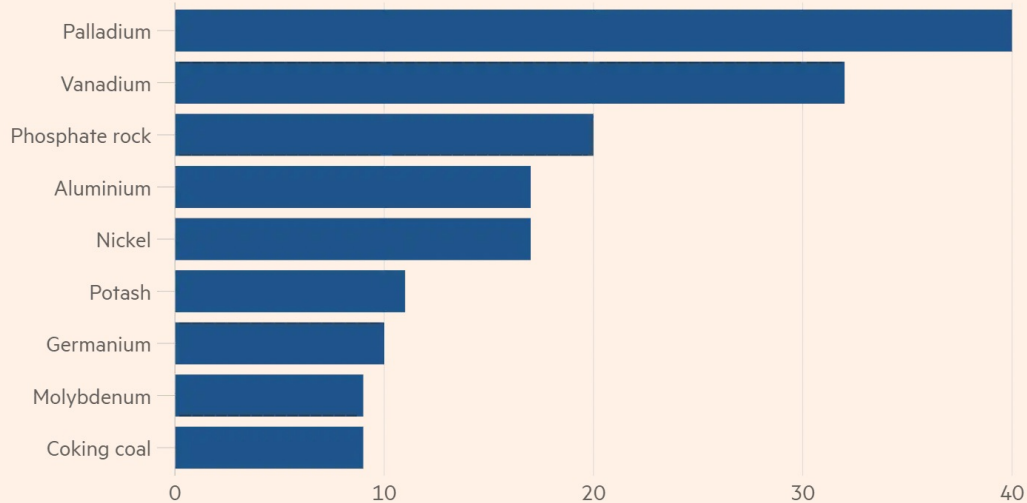
Climate resilience is the ability to anticipate, absorb, accommodate and recover from adverse climate impacts.

<https://ieeexplore.ieee.org/document/8644031>

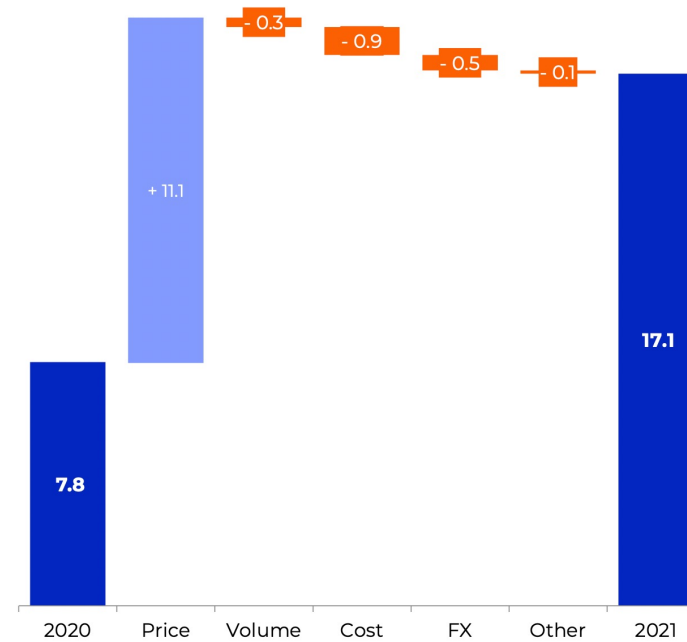
Madenler, Kritik Mineraller

The EU depends on Russia for critical raw materials

% of imports that come from Russia (selected materials, 2020)



Source: European Commission
© FT



Price: +\$11.1bn

- Stronger average commodity prices:
 - > Newcastle thermal coal: +125%, Cobalt: +60%, Copper: +51%, Zinc: +32%, Nickel: +34%, Ferrochrome: +61%, Brent oil: +65%

Volume: -\$0.3bn

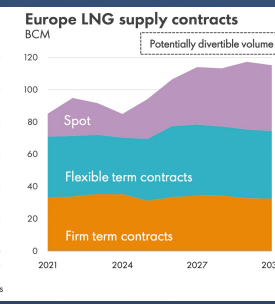
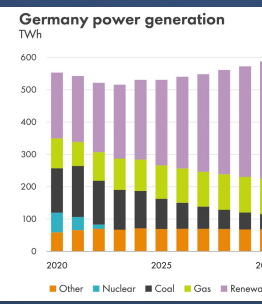
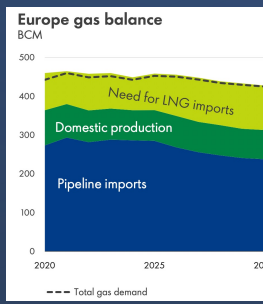
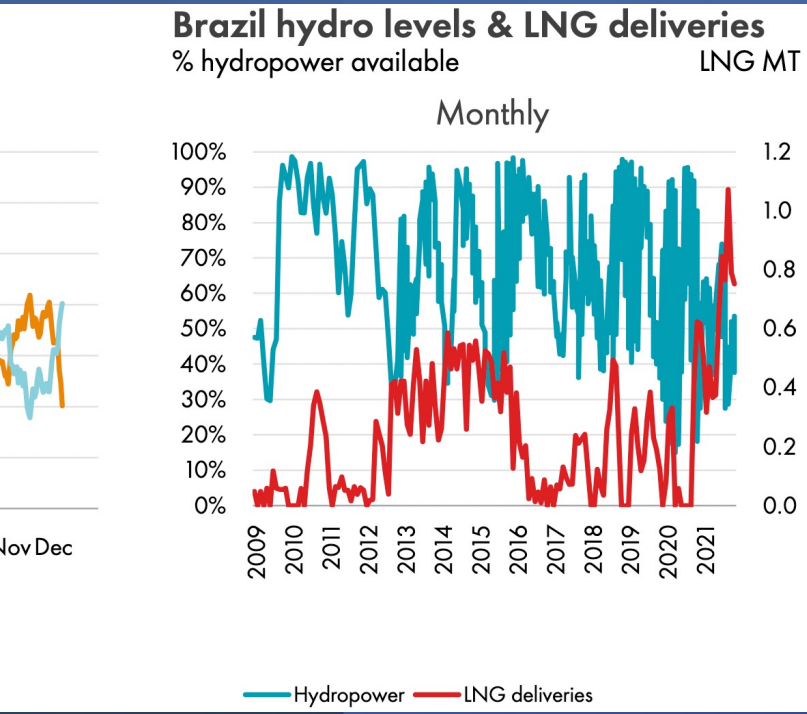
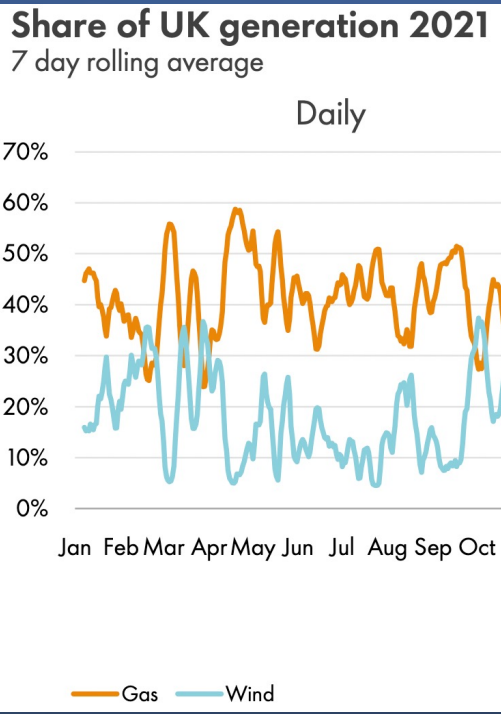
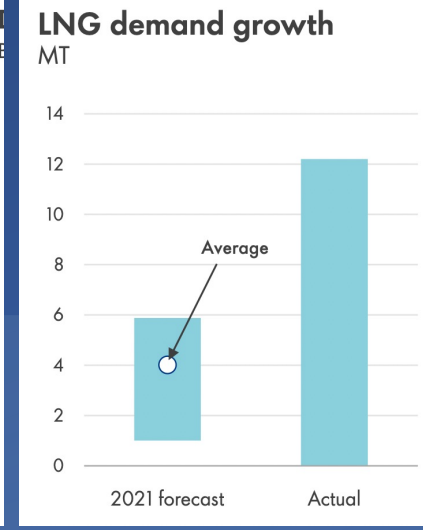
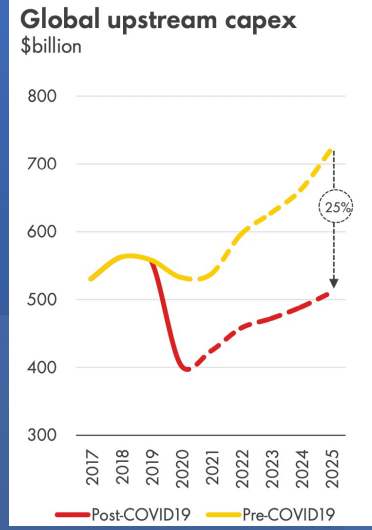
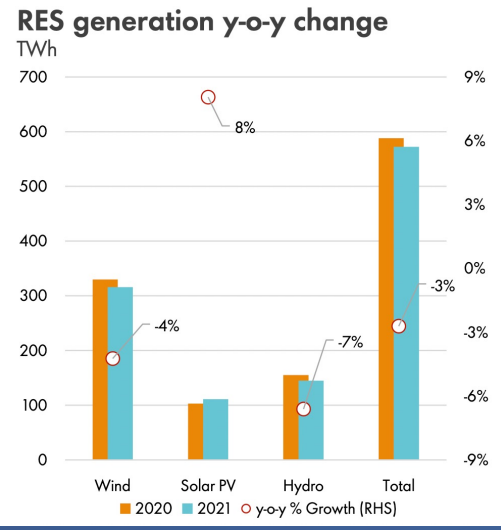
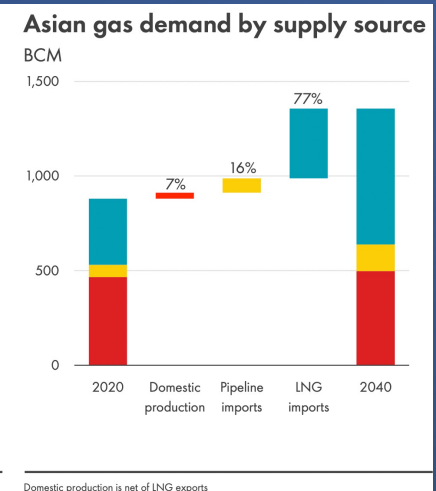
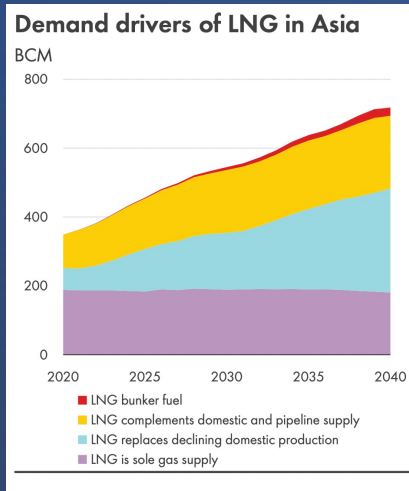
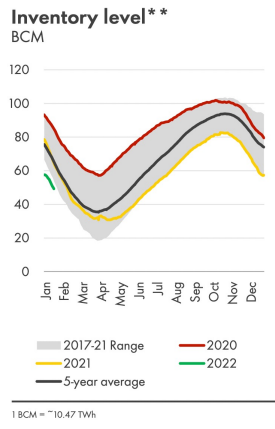
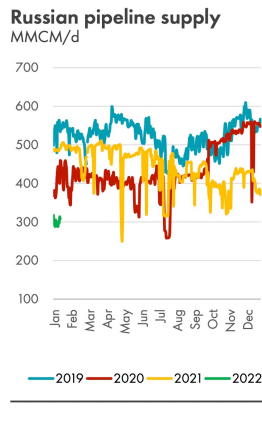
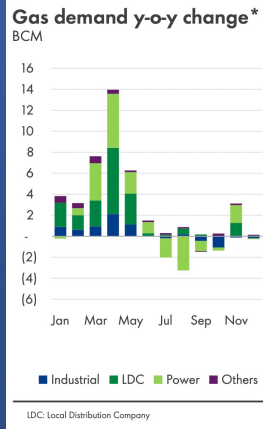
- Recovery from Covid-19 impacts at Antamina and Ferroalloys offset by lower SA Coal, Kazzinc, Murrin and Antapaccay production

Cost: -\$0.9bn

- Zinc: dramatically higher European energy costs impacting our large smelting portfolio
- Nickel: Koniambo maintenance challenges (power and furnace)
- General inflation (notably Kazakhstan and South Africa) and higher energy costs as they affect the whole portfolio

FX: -\$0.5bn

- Primarily stronger AUD, CAD and ZAR



AB – Ortak Hareket



Brussels, XXX
[...] (2022) XXX draft

SENSITIVE*
UNTIL ADOPTION

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE EUROPEAN COUNCIL, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

Joint European Action for more affordable, secure and sustainable energy



Action 2: accelerating permitting

Long permitting procedures constitutes one of the main barriers to rapid and large-scale renewable energy generation development.

The Renewable Energy Directive addresses the most important barriers to fast permitting procedures and limits the duration of permitting procedures to two years. **The Commission calls on Member States to accelerate the transposition and implementation of the Renewable energy directive Directive** and follow up on the duration of permitting procedures as a matter of urgency.

With regard to obligations stemming from environmental obligations, Member States should use all possibilities in the existing legal framework for the simplification and acceleration of the Environmental Impact Assessment (EIA) procedures. Member States should **cap the length of various steps of the EIA procedure**¹² by introducing **deadlines**, in particular for **issuing an EIA decision or development consent**¹³ and the **maximum time-frame for public consultations** of the EIA report¹⁴.

Action 6: Measures to re-use high rents

On wholesale electricity markets, gas-fired power plants set the market price whenever they are the most expensive units needed to ensure that the supply meets the demand. In such cases, the high costs of gas as an input for gas-fired power plants have translated into high wholesale electricity prices translating into high (windfall) profits for all market participants, irrespective of their generating costs. Given that low carbon and renewable generators have low operating costs, the profits they realise on the spot market have increased following the gas price increase.

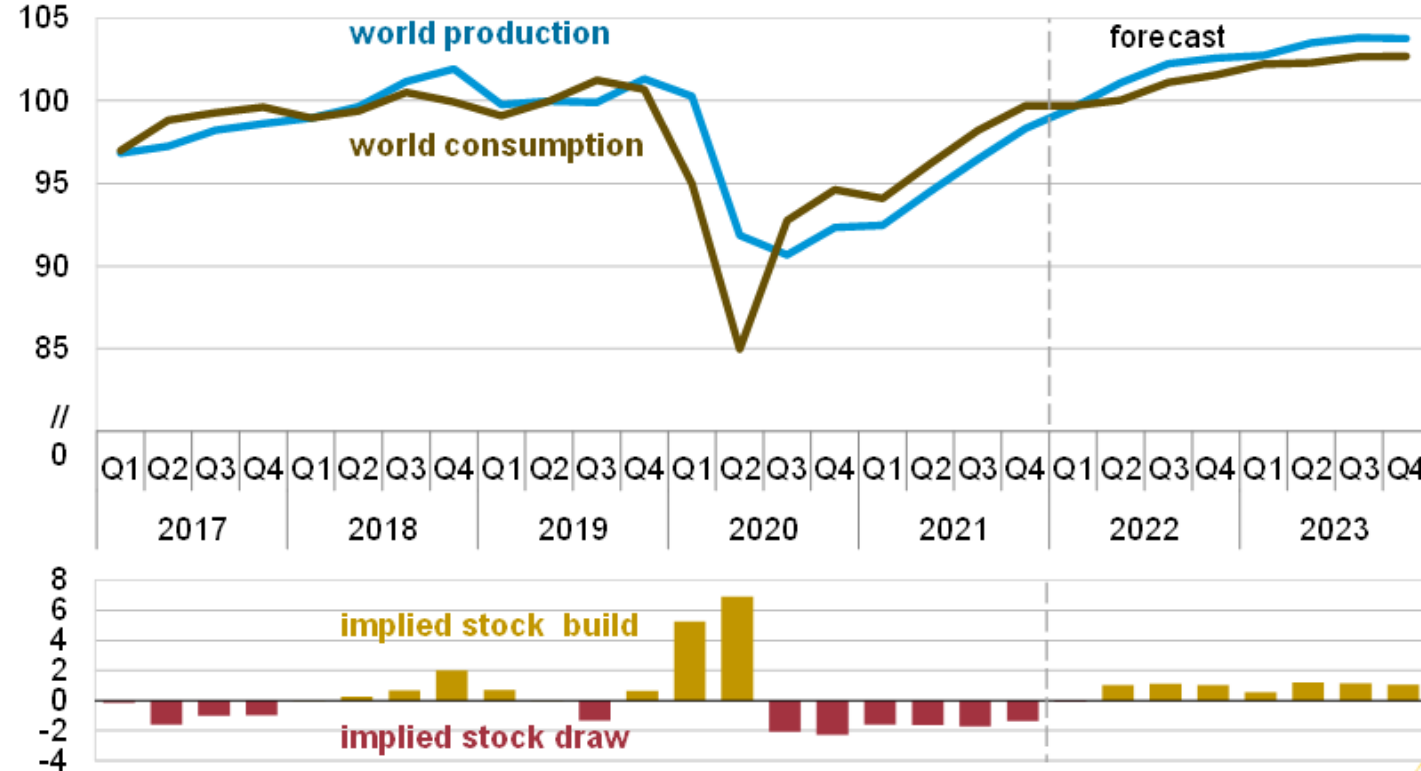
To finance support measures in this current crisis, Member States may want to capture a part of this additional infra-marginal rent by specific fiscal measures. However, such a measure would need to be carefully designed to avoid unnecessary market distortions as set out in annex 3.

To boost renewable hydrogen production, **carbon contracts for difference** under which a government or institution agrees with a market actor on a fixed carbon price over a given time period, constitute one way to help market actors minimize carbon price uncertainty. The **Innovation Fund** will support the initiative by covering the cost for the carbon contracts for difference. The Commission is providing EU financing to support the initial market ramp-up of hydrogen projects that it expects to amount to approximately EUR 800m per year as of 2022 and launched a hydrogen public funding compass to orient stakeholders to appropriate funding instruments⁸.

Using regulatory sandboxes accelerate permitting for innovation. The Commission will assess how regulatory sandboxes waiving certain obligations under EU law could support the deployment of wind energy projects. The North Sea Wind initiative will serve as a testing ground to allow innovators to test new technologies and business models that are only partially compatible with the existing legal and regulatory framework. The Commission will also provide guidance on the conditions for operating such sandboxes.

ABD Öngörmeleri

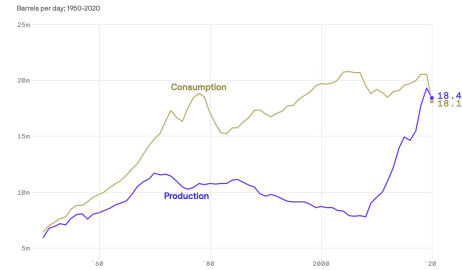
World liquid fuels production and consumption balance
million barrels per day



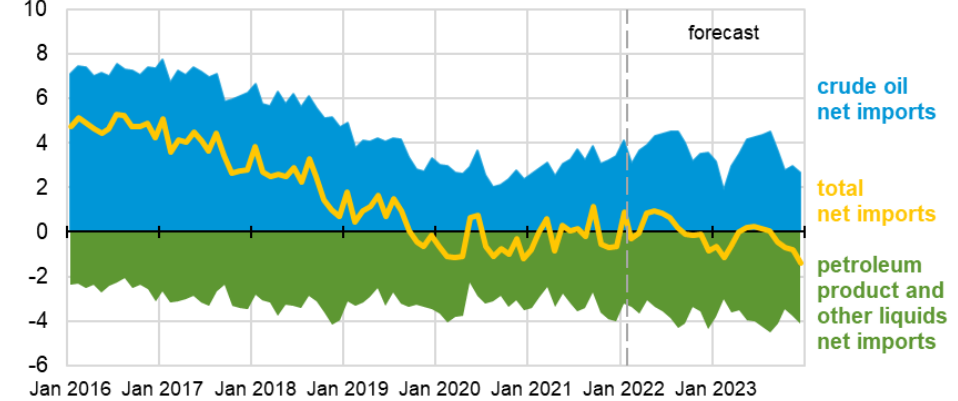
Source: U.S. Energy Information Administration, Short-Term Energy Outlook, February 2022



U.S. petroleum production and consumption



U.S. net imports of crude oil and liquid fuels
million barrels per day

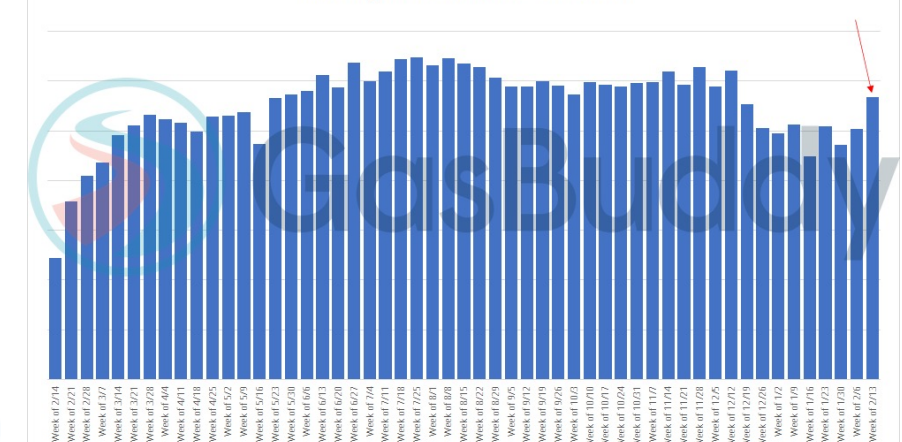


Note: Petroleum product and other liquids include: gasoline, distillate fuels, hydrocarbon gas liquids, jet fuel, residual fuel oil, unfinished oils, other hydrocarbons/oxygenates, and other oils.

Source: U.S. Energy Information Administration, Short-Term Energy Outlook, February 2022



Weekly U.S. Gasoline Demand



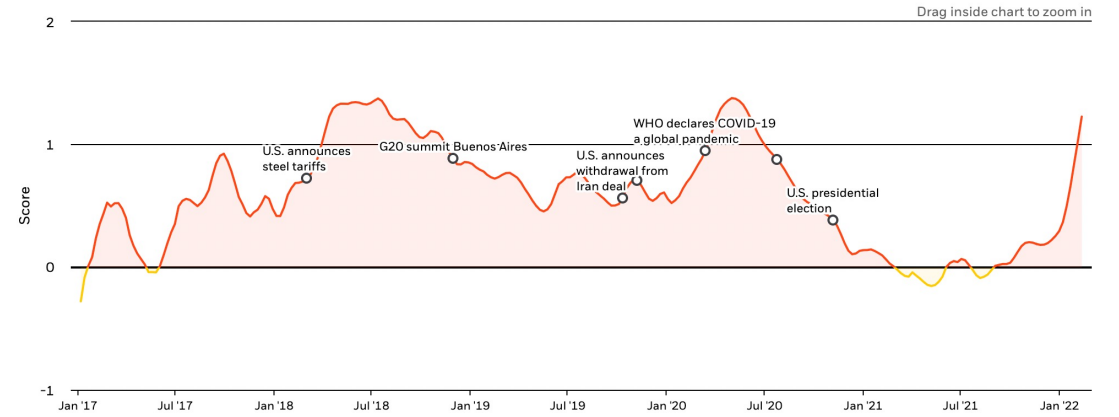
FuelInsights.GasBuddy.com

@GasBuddyGuy

Source: Pay with GasBuddy data

Jeopolitik Riskler

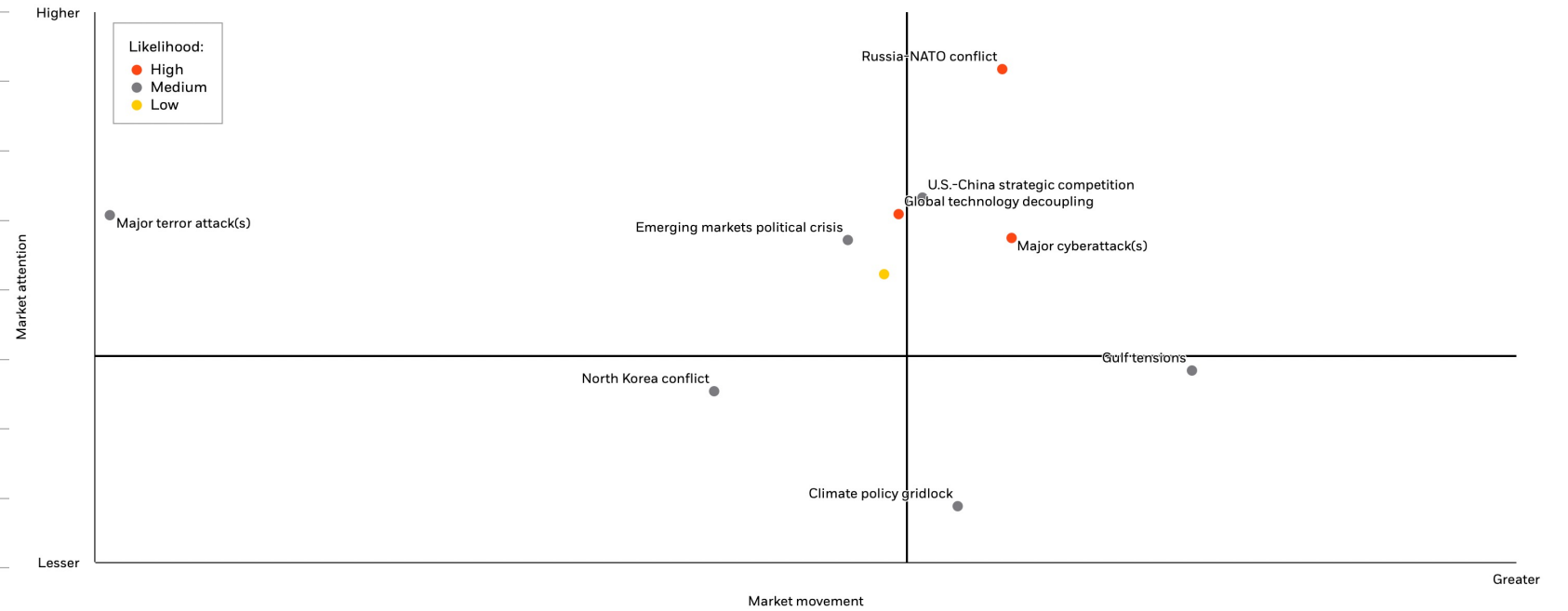
Global indicator



Geopolitical risk	Asset	Direction of assumed price impact
	Russian equities	▼
Russia-NATO conflict	Russian ruble	▼
	Brent crude oil	▲
	Chinese yuan	▼
Global technology decoupling	U.S. investment grade	▼
	Asia ex-Japan electrical	▼
	U.S. high yield utilities	▼
Major cyberattack(s)	U.S. dollar	▲
	U.S. utilities sector	▼
	Taiwanese dollar	▼
U.S.-China strategic competition	Taiwanese equities	▼
	China high yield	▼

Risk map

BlackRock Geopolitical market attention, market movement and likelihood



Gelecek eğrileri öngörü değildir

Date	CoalAPI2	Brent	JKM	TTF	HH	ULSD	Gasoline	DE_BaseLoad	DE_PeakLoad	TRYUSD	USDTRY
FEB 2022	185.0000	95.8750	23.812500	64.687500	4.703125	824.5	889.500	121.1250	150.1250	NaN	13.757812
MAR 2022	165.5000	94.6875	23.812500	64.687500	4.429688	805.0	890.500	151.7500	177.5000	0.072449	13.804688
APR 2022	152.7500	93.5625	23.812500	63.937500	4.378906	789.0	892.500	162.5000	180.8750	NaN	14.046875
MAY 2022	142.5000	91.3750	24.312500	63.406250	4.398438	775.0	879.000	163.6250	179.6250	NaN	14.281250
JUN 2022	138.6250	89.6875	24.578125	63.218750	4.441406	763.5	864.000	172.1250	192.6250	0.068848	14.523438
JUL 2022	134.8750	88.3750	24.656250	63.125000	4.496094	756.5	846.000	171.7500	198.8750	NaN	14.828125
AUG 2022	131.2500	87.3125	24.625000	63.000000	4.503906	752.5	830.500	168.0000	189.8750	NaN	15.125000
SEP 2022	129.2500	86.3750	24.812500	63.062500	4.488281	750.0	813.500	183.1250	205.2500	0.064819	15.429688
OCT 2022	127.2500	85.6250	25.125000	63.281250	4.511719	745.0	789.000	178.3750	223.8750	NaN	15.726562
NOV 2022	125.3750	84.9375	25.921875	63.843750	4.601562	739.0	771.000	193.0000	227.6250	NaN	16.031250
DEC 2022	124.1875	84.2500	26.343750	64.000000	4.753906	733.5	759.000	181.5000	231.0000	0.061249	16.328125
JAN 2023	123.1250	83.6250	26.578125	64.125000	4.851562	729.0	518.500	184.6250	231.5000	NaN	16.625000
FEB 2023	122.0000	83.0000	26.453125	64.125000	4.687500	724.5	564.000	182.3750	229.0000	NaN	16.921875
MAR 2023	119.0625	82.4375	24.265625	61.250000	4.277344	720.0	579.000	172.5000	213.6250	0.058075	17.218750
APR 2023	116.1875	82.0000	17.062500	42.093750	3.470703	717.0	632.000	118.0000	137.2500	NaN	17.593750
MAY 2023	113.3750	81.5000	15.843750	39.125000	3.398438	713.0	572.500	114.5625	136.0000	NaN	17.953125
JUN 2023	110.6250	81.0000	15.773438	38.437500	3.443359	710.0	555.000	110.3750	131.2500	0.054565	18.328125
JUL 2023	108.0000	80.5625	15.351562	38.531250	3.494141	707.0	551.000	112.8750	131.1250	NaN	18.328125
AUG 2023	105.3750	80.1875	15.632812	38.656250	3.507812	705.5	516.500	115.1250	134.3750	NaN	18.328125
SEP 2023	103.6875	79.7500	15.851562	38.750000	3.494141	704.5	569.500	117.4375	137.2500	NaN	18.328125
OCT 2023	102.0625	79.3750	16.093750	39.250000	3.525391	702.0	553.500	140.6250	181.5000	NaN	18.328125
NOV 2023	100.3750	79.0625	16.562500	40.343750	3.634766	698.5	579.500	142.5000	185.6250	NaN	18.328125
DEC 2023	101.1250	78.6250	16.687500	40.500000	3.845703	696.0	581.000	144.3750	189.5000	NaN	18.328125
JAN 2024	101.7500	78.3125	17.187500	40.468750	3.970703	694.0	561.500	140.2500	192.6250	NaN	18.328125
FEB 2024	102.4375	77.9375	17.031250	40.250000	3.865234	692.0	568.500	138.2500	190.1250	NaN	18.328125
MAR 2024	103.1250	77.6875	16.328125	38.218750	3.605469	690.0	243.625	136.2500	185.3750	NaN	18.328125
APR 2024	103.8125	77.3750	13.210938	31.859375	3.140625	688.0	241.375	88.6250	105.1875	NaN	18.328125
MAY 2024	104.5000	77.0625	11.757812	28.250000	3.087891	685.5	329.250	86.2500	104.1250	NaN	18.328125
JUN 2024	105.1875	76.7500	11.359375	27.125000	3.140625	684.0	393.750	84.0625	101.2500	NaN	18.328125
JUL 2024	105.0000	76.5000	11.617188	27.781250	3.197266	683.0	391.750	84.6875	112.9375	NaN	18.328125
AUG 2024	104.8125	76.3125	11.632812	27.625000	3.218750	682.0	410.750	85.6875	114.7500	NaN	18.328125
SEP 2024	104.6250	76.0625	11.835938	28.000000	3.207031	681.0	387.750	87.6250	117.3125	NaN	18.328125

Date	Brent	Gasoline	TTF	CoalAPI2	USDTRY	benzin_TL	dizel_TL	gaz_TL	elektrik_TL	gazdan_elektrik_TL	komurden_elektrik_TL	GOP_TL
FEB 2022	95.8750	889.5	64.68750	185.0000	13.757812	15.609375	15.632812	7.126020	2.213846	1143.0	909.0	1257.0
MAR 2022	94.6875	890.5	64.68750	165.5000	13.804688	15.664062	15.421875	7.102420	2.210827	1139.0	816.0	1252.0
APR 2022	93.5625	892.5	63.93750	152.7500	14.046875	15.921875	15.429688	7.154339	2.234123	1147.0	767.0	1261.0
MAY 2022	91.3750	879.0	63.40625	142.5000	14.281250	15.992188	15.445312	7.154339	2.249158	1149.0	727.0	1263.0
JUN 2022	89.6875	864.0	63.21875	138.6250	14.523438	16.031250	15.500000	7.192100	2.270094	1155.0	719.0	1270.0
JUL 2022	88.3750	846.0	63.12500	134.8750	14.828125	16.078125	15.664062	7.277060	2.306287	1170.0	714.5	1287.0
AUG 2022	87.3125	830.5	63.00000	131.2500	15.125000	16.156250	15.882812	7.366740	2.339544	1184.0	709.0	1302.0
SEP 2022	86.3750	813.5	63.06250	129.2500	15.429688	16.203125	16.109375	7.470580	2.379276	1202.0	712.5	1322.0
OCT 2022	85.6250	789.0	63.28125	127.2500	15.726562	16.125000	16.296875	7.579140	2.420189	1221.0	714.5	1343.0
NOV 2022	84.9375	771.0	63.84375	125.3750	16.031250	16.140625	16.468750	7.711299	2.463462	1242.0	718.0	1366.0
DEC 2022	84.2500	759.0	64.00000	124.1875	16.328125	16.234375	16.640625	7.824580	2.503799	1261.0	724.0	1387.0
JAN 2023	83.6250	518.5	64.12500	123.1250	16.625000	13.007812	16.828125	7.933140	2.544711	1280.0	731.5	1408.0
FEB 2023	83.0000	564.0	64.12500	122.0000	16.921875	13.859375	17.015625	8.032260	2.582688	1298.0	737.0	1427.0
MAR 2023	82.4375	579.0	61.25000	119.0625	17.218750	14.289062	17.187500	8.027539	2.595885	1296.0	733.0	1425.0
APR 2023	82.0000	632.0	42.09375	116.1875	17.593750	15.351562	17.468750	7.376180	2.472091	1185.0	730.0	1303.0
MAY 2023	81.5000	572.5	39.12500	113.3750	17.953125	14.687500	17.687500	7.366740	2.489924	1184.0	727.5	1302.0
JUN 2023	81.0000	555.0	38.43750	110.6250	18.328125	14.664062	17.968750	7.456419	2.528970	1199.0	724.5	1318.0
JUL 2023	80.5625	551.0	38.53125	108.0000	18.328125	14.601562	17.906250	7.442260	2.525430	1196.0	707.5	1315.0

<https://github.com/barissanli/papers/tree/main/18ayTürkiyeEnerjiFiyatları>

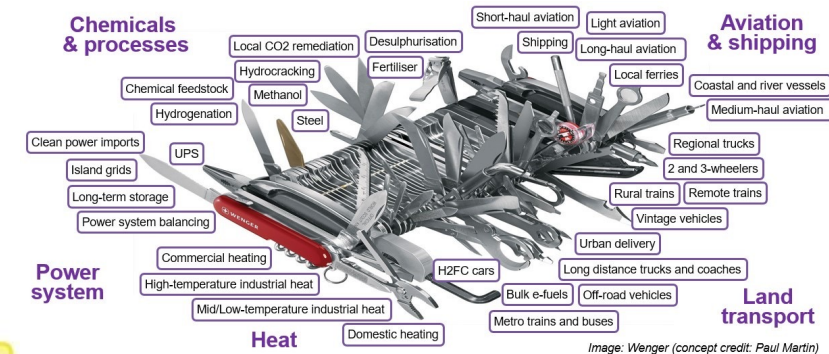
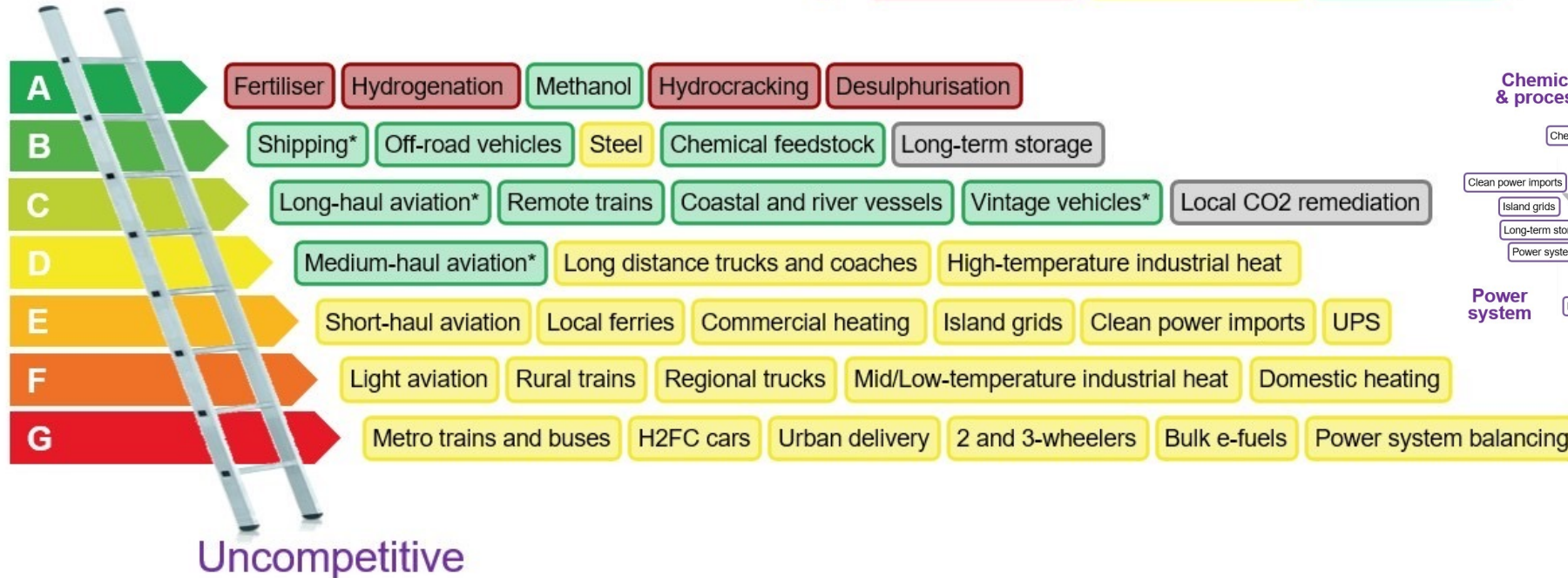
Hidrogen

Clean Hydrogen Ladder: Competing technologies

Liebreich Associates

Unavoidable

Key: No real alternative Electricity/batteries Biomass/biogas Other



* Via ammonia or e-fuel rather than H2 gas or liquid

Source: Liebreich Associates (concept credits: Adrian Hiel/Energy Cities & Paul Martin)

Karbon Fiyat Reformu

Article 29a

Measures in the event of excessive price fluctuations

1. If, for more than six consecutive months, the allowance price is more than three times the average price of allowances during the two preceding years on the European carbon market, the Commission shall immediately convene a meeting of the Committee established by Article 9 of Decision No 280/2004/EC.

2. If the price evolution referred to in paragraph 1 does not correspond to changing market fundamentals, one of the following measures may be adopted, taking into account the de

(a) a measure which allows Member State

(b) a measure which allows Member State
Those measures shall be adopted in accorc

3. Any measure shall take utmost account
pursuant to Article 29, as well as any other

4. The arrangements for the application of

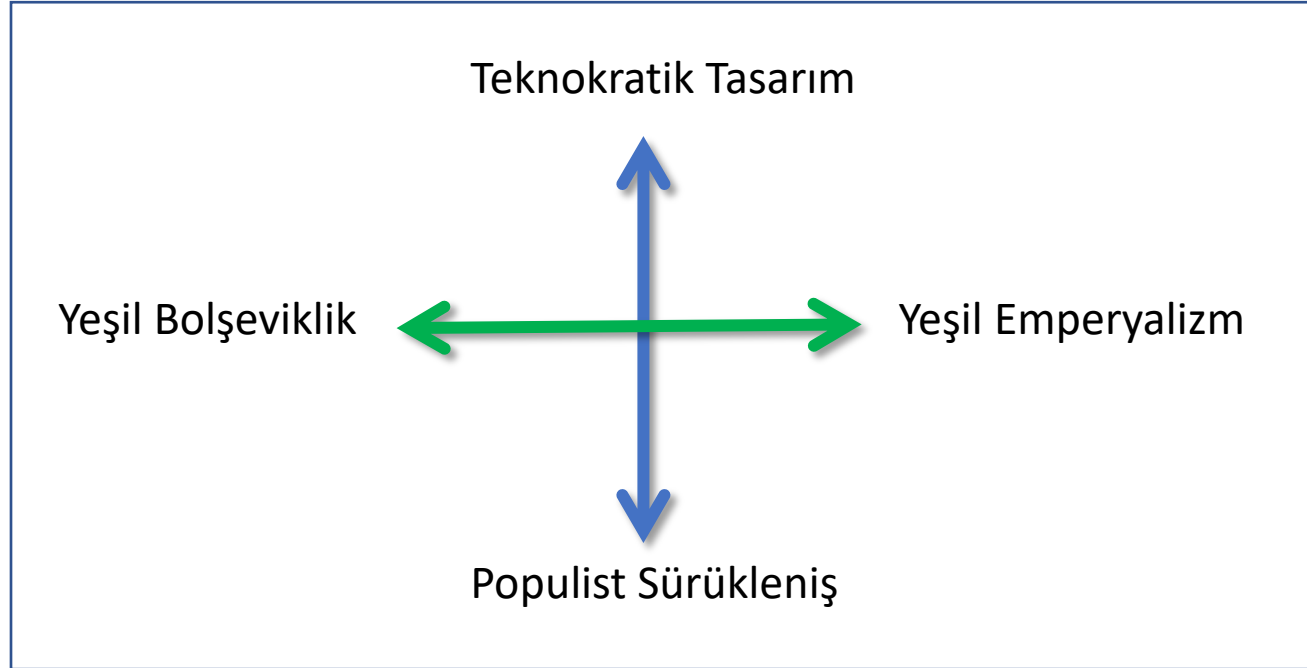
▼M9 ↓



CONTRACT	LAST	TIME(GMT)	% CHANGE	VOLUME
APR22	88.520	2/22/2022 10:03 AM	-0.885	9
DEC22	88.900	2/22/2022 11:33 AM	-0.870	8667
MAR23	89.240	2/22/2022 9:53 AM	-0.998	65
DEC23	90.530	2/22/2022 11:33 AM	-0.691	1118

Nereye peki?

Uzun Dönem



Yakın Dönem

- Kaos platosu
 - Kaç kutuplu dünya
 - Kaynak savaşları
 - Daha fazla para basımı
 - Daha spekülatif dünya
- Büyük Kırılma
 - Tüketici riskleri kaldıramaz
 - Tüketim zarar alır
 - Herkes yarasını sarmak zorunda kalır

Teşekkürler

Barış Sanlı

<http://barissanli.com>