

URANYUMDA KÜRESEL TRENDLER

SIFIR KARBON POLİTİKASI

PANDEMİ

Küresel Ticari
Çekişmeler

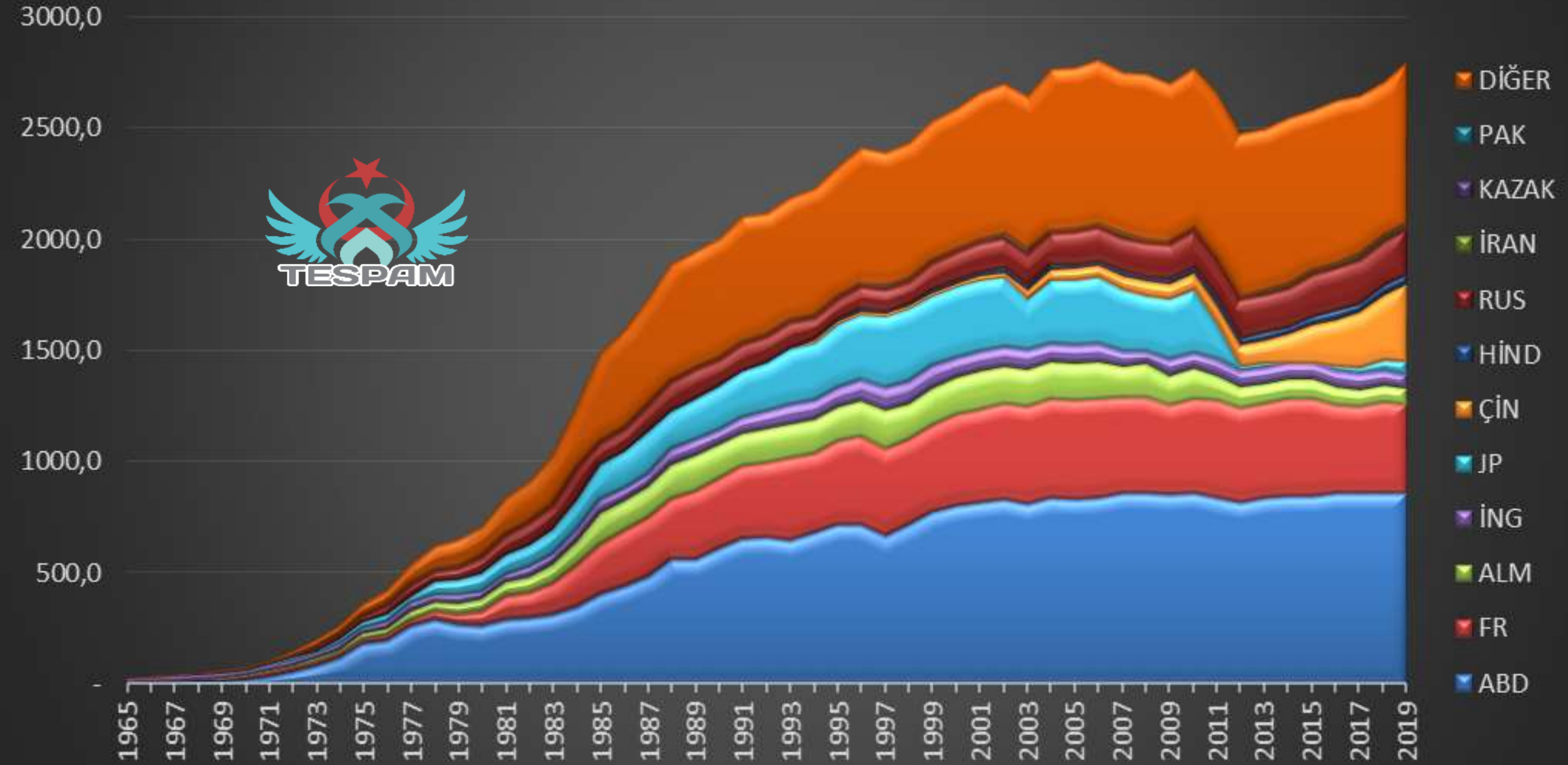
CO2'yu
Siyasi Baskı
Aracı Olarak
Kullanma



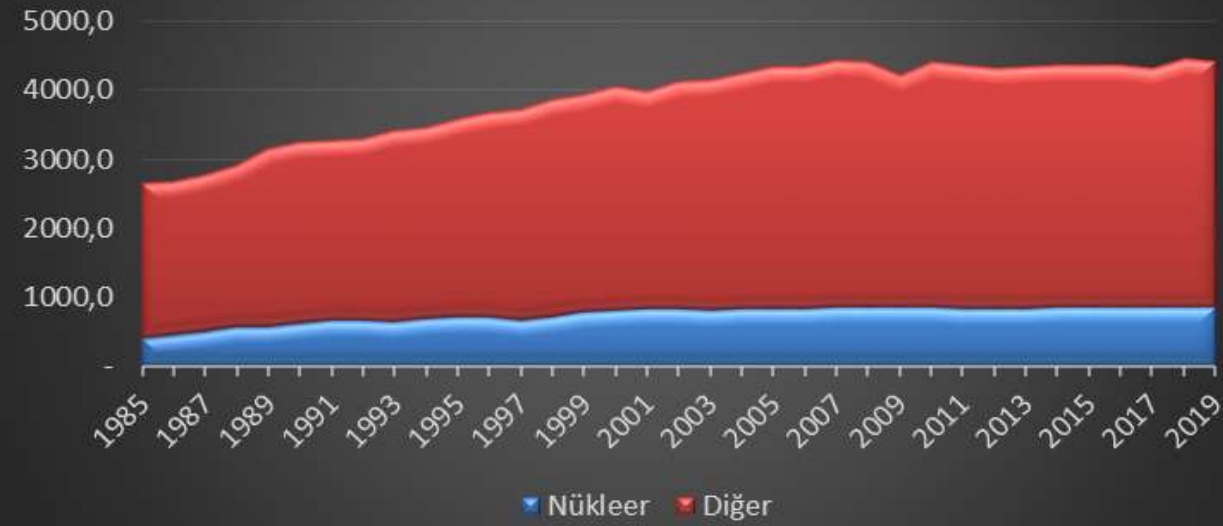
ADİL, UYGULANABİLİR VE MERHAMETLİ BİR İKLİM MODELİ VİZYONU



Nükleer Elektrik Üretimi (twh)



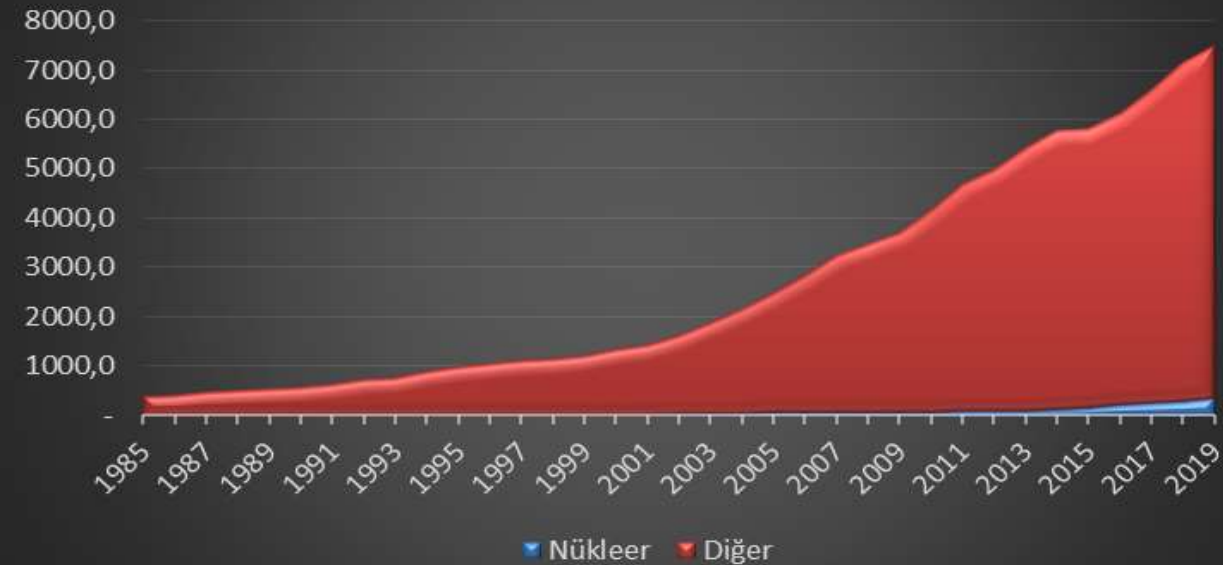
ABD Elektrik Üretimi & Nükleer (twh)



Japonya Elektrik Üretimi & Nükleer (twh)



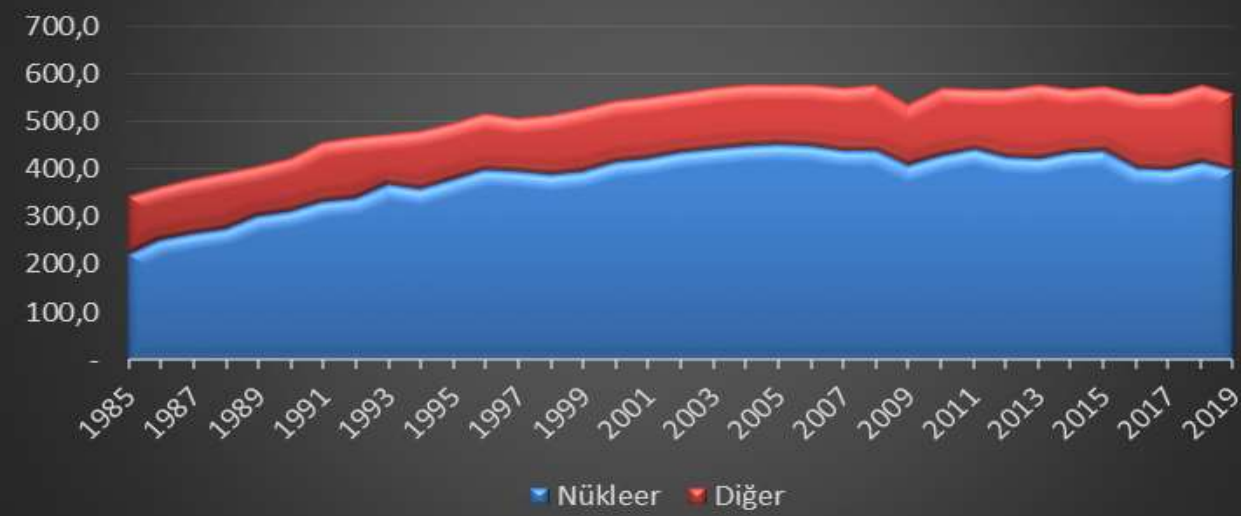
Çin Elektrik Üretimi & Nükleer (twh)



Hindistan Elektrik Üretimi & Nükleer (twh)



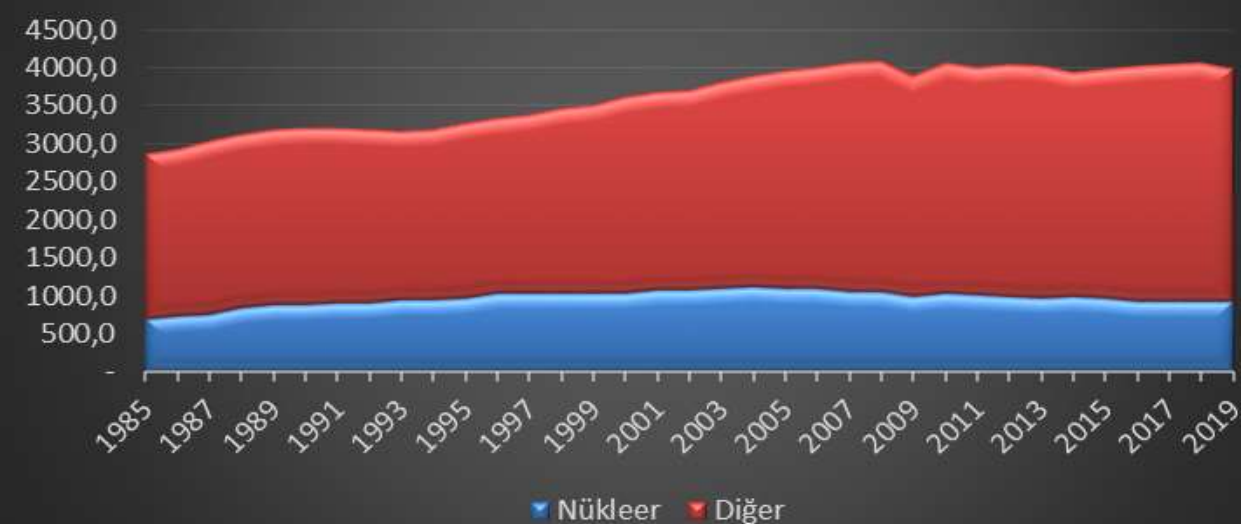
Fransa Elektrik Üretimi & Nükleer (twh)



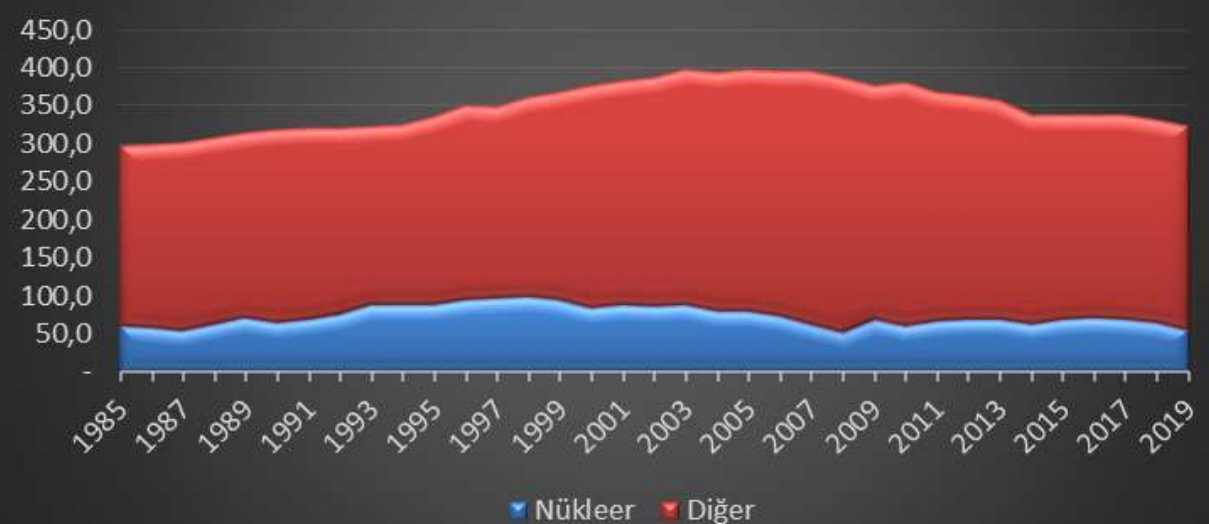
Almanya Elektrik Üretimi & Nükleer (twh)



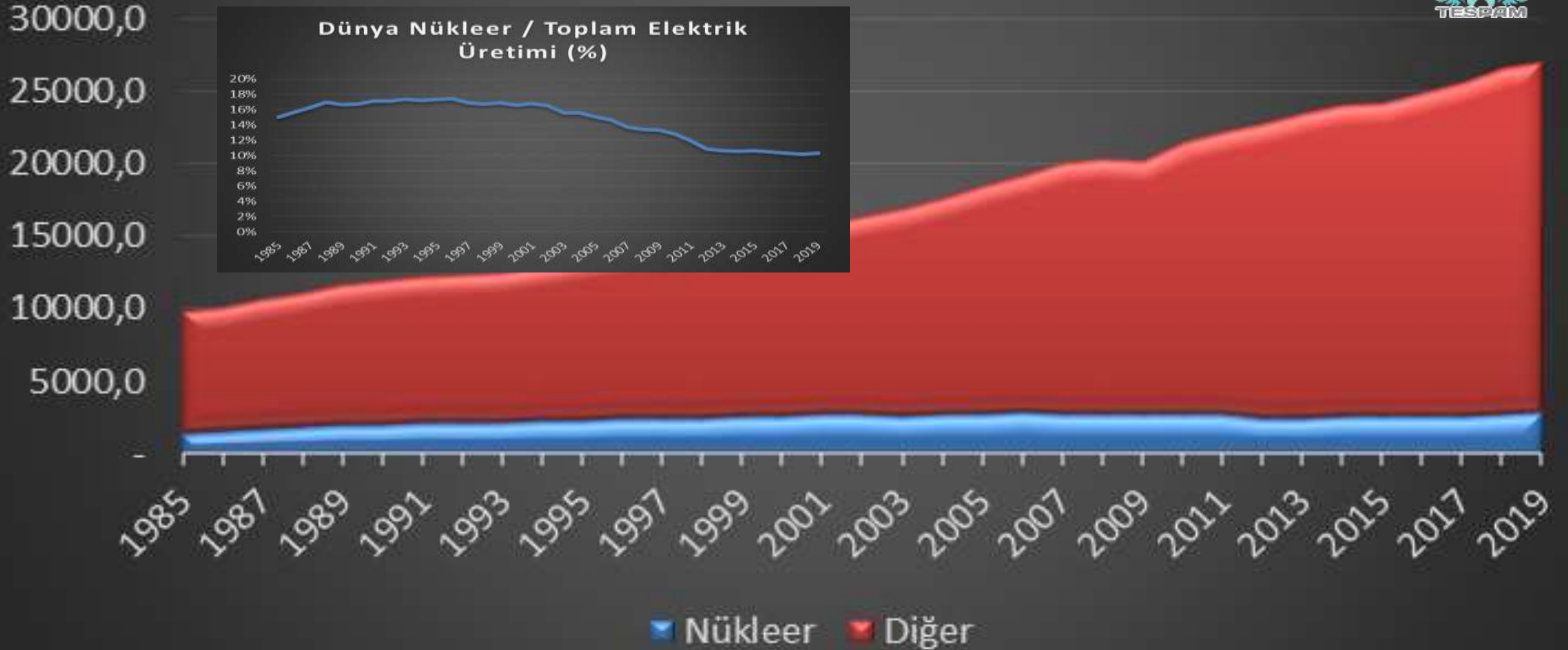
Avrupa Elektrik Üretimi & Nükleer (twh)



İngiltere Elektrik Üretimi & Nükleer (twh)



Dünya Elektrik Üretimi & Nükleer (twh)



NÜKLEER ÜRETİM ve PLANLAR

ÜLKELER	İŞLEVSEL REAKTÖR		İNŞA HALİNDEKİ REAKTÖR		PLANLANAN REAKTÖR		HEDEFLenen REAKTÖR		2021'DE İHTİYAÇ DUYULAN URANYUM
	No.	MWe net	No.	MWe gross	No.	MWe gross	No.	MWe gross	tonnes U
China	49	47,498	16	17,253	39	43,085	168	196,91	10,814
France	56	61,37	1	1650	0	0	0	0	8701
Germany	6	8113	0	0	0	0	0	0	587
India	23	6885	6	4600	14	10,5	28	32	1080
Iran	1	915	1	1057	1	1057	5	2760	161
Japan	33	31,679	2	2756	1	1385	8	11,562	2344
Pakistan	5	1318	2	2200	1	1170	0	0	636
Russia	38	28,578	2	2510	21	21,38	23	22,5	6227
United Kingdom	15	8923	2	3440	2	3340	2	2300	1820
USA	94	96,553	2	2500	3	2550	18	8000	18,295

ÜLKELER 	İŞLEVSEL REAKTÖR		İNŞA HALİNDEKİ REAKTÖR		PLANLANAN REAKTÖR		HEDEFLENEN REAKTÖR		2021'DE İHTİYAÇ DUYULAN URANYUM
	No.	MWe net	No.	MWe gross	No.	MWe gross	No.	MWe gross	tonnes U
Argentina	3	1641	1	29	1	1150	2	1350	206
Armenia	1	375	0	0	0	0	1	1060	77
Belarus	1	1110	1	1194	0	0	2	2400	146
Belgium	7	5930	0	0	0	0	0	0	898
Brazil	2	1884	1	1405	0	0	4	4000	358
Bulgaria	2	2006	0	0	1	1000	1	1000	334
Canada	19	13,554	0	0	0	0	2	1500	1409
Czech Republic	6	3932	0	0	1	1200	3	3600	694
Finland	4	2794	1	1720	1	1250	0	0	758
Hungary	4	1902	0	0	2	2400	0	0	360
Korea (South)	24	23,172	4	5600	0	0	2	2800	5121
Mexico	2	1552	0	0	0	0	3	3000	239
Netherlands	1	482	0	0	0	0	0	0	74
Romania	2	1300	0	0	2	1440	1	720	187
Slovakia	4	1814	2	942	0	0	1	1200	428
Slovenia	1	688	0	0	0	0	1	1000	141
South Africa	2	1860	0	0	0	0	8	9600	294
Spain	7	7121	0	0	0	0	0	0	1217
Sweden	6	6859	0	0	0	0	0	0	985
Switzerland	4	2960	0	0	0	0	0	0	446
Ukraine	15	13,107	2	1900	0	0	2	2,4	1879
Dünya Toplam	442	393,064	53	59,756	98	102,507	326	355,662	68,269

YENİ NÜKLEER TEKNOLOJİ İLE TANIŞANLAR

ÜLKELER	İŞLEVSEL REAKTÖR		İNŞA HALİNDEKİ REAKTÖR		PLANLANAN REAKTÖR		HEDEFLENEN REAKTÖR		2021'DE İHTİYAÇ
	No.	MWe net	No.	MWe gross	No.	MWe gross	No.	MWe gross	tonnes U
Bangladesh	0	0	2	2400	0	0	2	2400	0
Egypt	0	0	0	0	4	4800	0	0	0
Jordan	0	0	0	0	0	0	1	1000	0
Kazakhstan	0	0	0	0	0	0	2	600	0
Lithuania	0	0	0	0	0	0	2	2700	0
Poland	0	0	0	0	0	0	6	6000	0
Saudi Arabia	0	0	0	0	0	0	16	17	0
Thailand	0	0	0	0	0	0	2	2000	0
Turkey	0	0	2	2400	2	2400	8	9500	0
UAE	1	1345	3	4200	0	0	0	0	877
Uzbekistan	0	0	0	0	2	2400	2	2400	0

URANYUM ZENGİNLEŞTİRME KAPASİTELERİ (swu/yr)

Country	Company and plant	2013	2015	2020
France	Areva, Georges Besse I & II	5500	7000	7500
Germany-Netherlands-UK	Urenco: Gronau, Germany; Almelo, Netherlands; Capenhurst, UK.	14,200	14,400	14,900
Japan	JNFL, Rokkaasho	75	75	75
USA	USEC, Piketon	0*	0	0
USA	Urenco, New Mexico	3500	4700	4700
USA	Global Laser Enrichment, Paducah	0	0	0
Russia	Tenex: Angarsk, Novouralsk, Zelenogorsk, Seversk	26,000	26,578	28,663
China	CNNC, Hanzhun & Lanzhou	2200	5760	10,700+
Other	Various: Argentina, Brazil, India, Pakistan, Iran	75	100	170
Total SWU/yr approx		51,550	58,600	66,700
Requirements (<i>WNA reference scenario</i>)		49,154	47,285	57,456

URANYUM ZENGİNLEŞTİRME PLANLAR

Operator	2018	2020	2030
CNNC	6750	6750	19,644
Orano	7500	7500	7500
Rosatom	28,215	27,654	25,000
Urenco	18,600	18,320	16,487
Other	46	66	450
Total	61,111	60,199	69,081

URANYUM ÜRETİCİ ŞİRKETLER

	tonnes U	% of world
Kazatomprom	12,229*	22
Orano	5809	11
Cameco	4754	9
Uranium One	4624	8
CNNC	3961	7
CGN	3871	7
Navoi Mining	3500	6
BHP	3364	6
ARMZ	2904	5
Energy Asia	2122	4
General Atomics/Quasar	1764	3
Sopamin	1032	2
Rio Tinto	1016	2
VostGok	801	1
Other	3001	5
Total	54,752	100



BAZI VERİLER

Yıllık Uranyum Üretimleri (ton)										
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Kazakhstan	17,803	19,451	21,317	22,451	23,127	23,607	24,586	23,321	21,705	22,808
Canada	9783	9145	8999	9331	9134	13,325	14,039	13,116	7001	6938
Australia	5900	5983	6991	6350	5001	5654	6315	5882	6517	6613
Namibia	4496	3258	4495	4323	3255	2993	3654	4224	5525	5476
Uzbekistan (est.)	2400	2500	2400	2400	2400	2385	2404	2404	2404	3500
Niger	4198	4351	4667	4518	4057	4116	3479	3449	2911	2983
Russia	3562	2993	2872	3135	2990	3055	3004	2917	2904	2911
China (est.)	827	885	1500	1500	1500	1616	1616	1885	1885	1885
Ukraine	850	890	960	922	926	1200	1005	550	1180	801
USA	1660	1537	1596	1792	1919	1256	1125	940	582	67
India (est.)	400	400	385	385	385	385	385	421	423	308
South Africa (est.)	583	582	465	531	573	393	490	308	346	346
Iran (est.)	0	0	0	0	0	38	0	40	71	71
Pakistan (est.)	45	45	45	45	45	45	45	45	45	45
Czech Republic	254	229	228	215	193	155	138	0	0	0
Romania	77	77	90	77	77	77	50	0	0	0
Brazil	148	265	326	192	55	40	44	0	0	0
France	7	6	3	5	3	2	0	0	0	0
Germany	8	51	50	27	33	0	0	0	0	0
Malawi	670	846	1101	1132	369	0	0	0	0	0
Total world	53,671	53,493	58,493	59,331	56,041	60,304	62,379	59,462	53,498	54,752
% of world demand	84%	87%	94%	91%	85%	98%	96%	93%	80%	84%

	Kanıtlanmış Uranyum Rezervi	%
Australia	1,692,700	28%
Kazakhstan	906,8	15%
Canada	564,9	9%
Russia	486	8%
Namibia	448,3	7%
South Africa	320,9	5%
Brazil	276,8	5%
Niger	276,4	4%
China	248,9	4%
Mongolia	143,5	2%
Uzbekistan	132,3	2%
Ukraine	108,7	2%
Botswana	87,2	1%
Tanzania	58,2	1%
Jordan	52,5	1%
USA	47,9	1%
Other	295,8	5%
World total	6,147,800	

URANYUM ÜRETİMİ

Kazakistan %42

Kanada %13

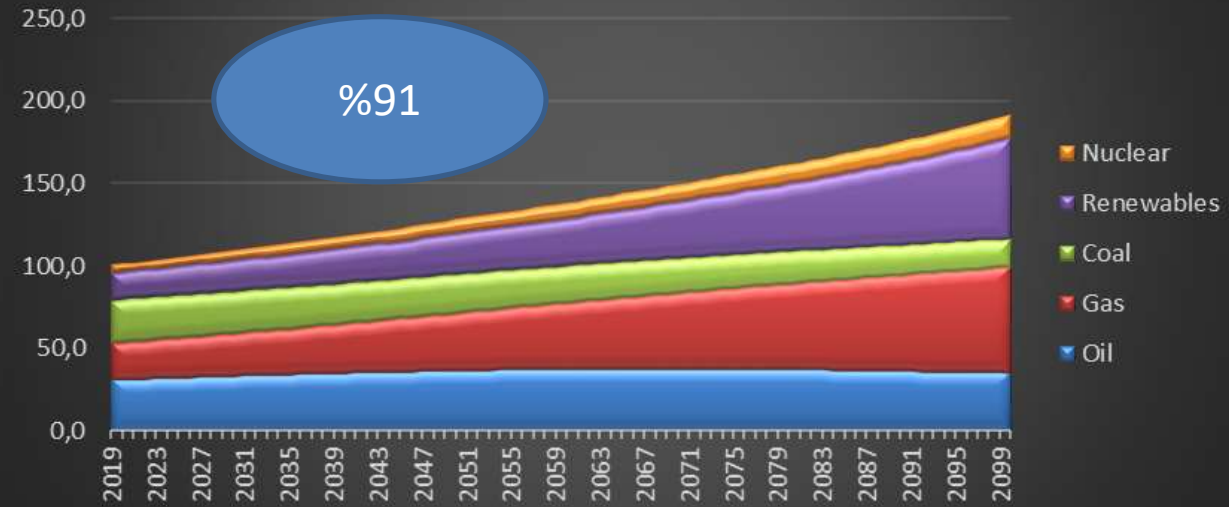
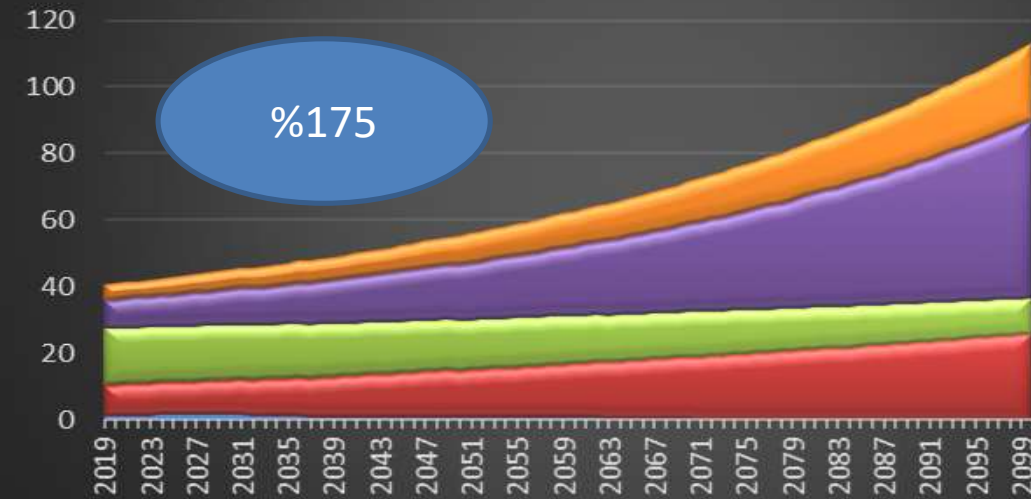
Avustralya %12



Electricity Consumption by Sources (billion boe)



Total Primary Energy Consumption (billion boe)

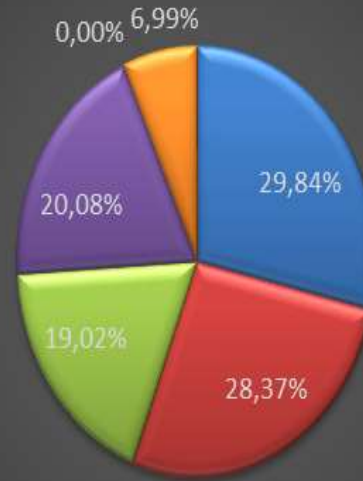


2019 Shares of Energy Types



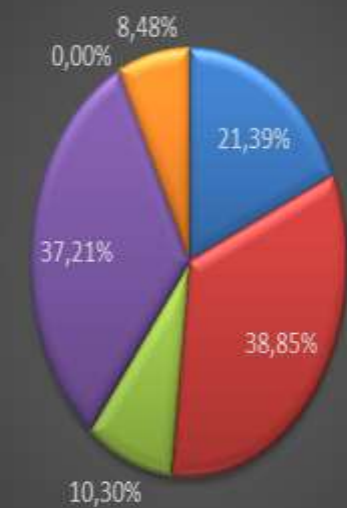
oil gas coal ren nuc

2050 Shares of Energy Types



oil gas coal ren nuc

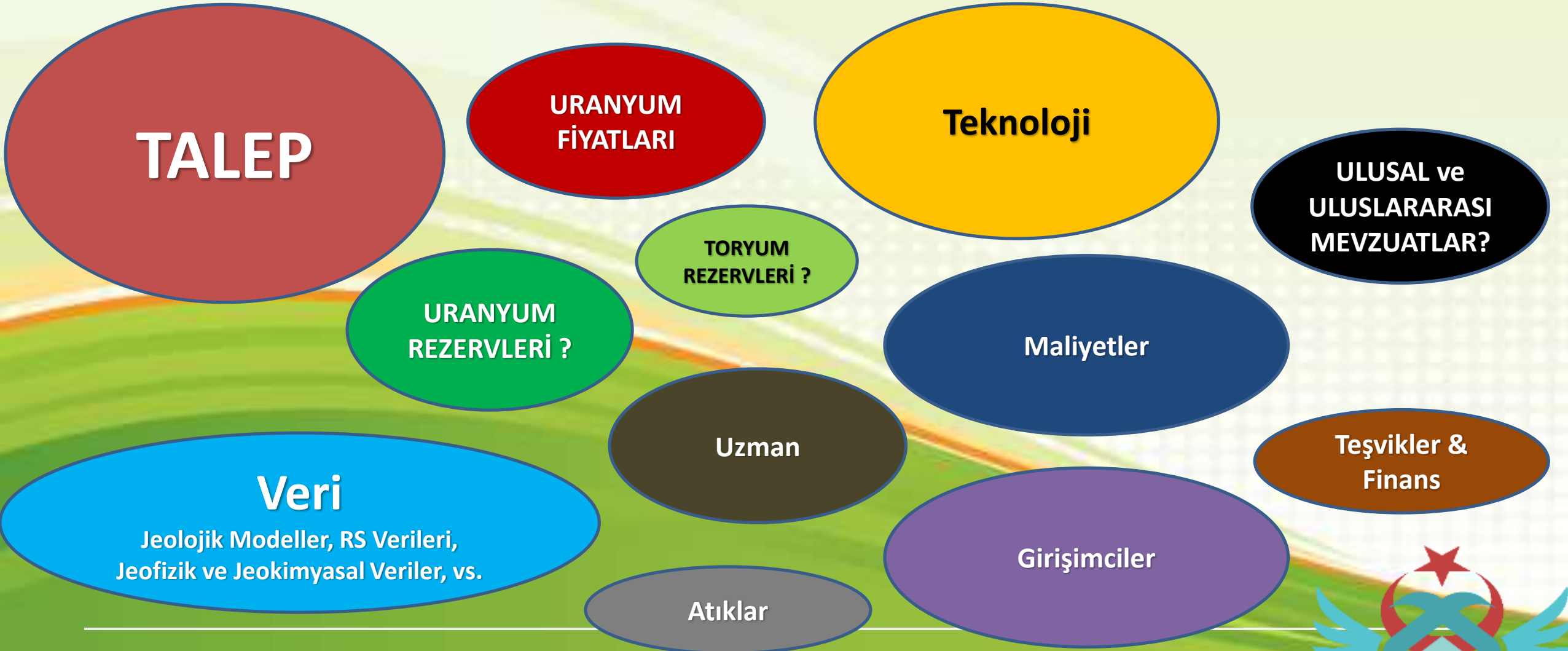
2100 Shares of Energy Types



oil gas coal ren nuc

MİLLİ URANYUM ve TORYUM POLİTİKASI

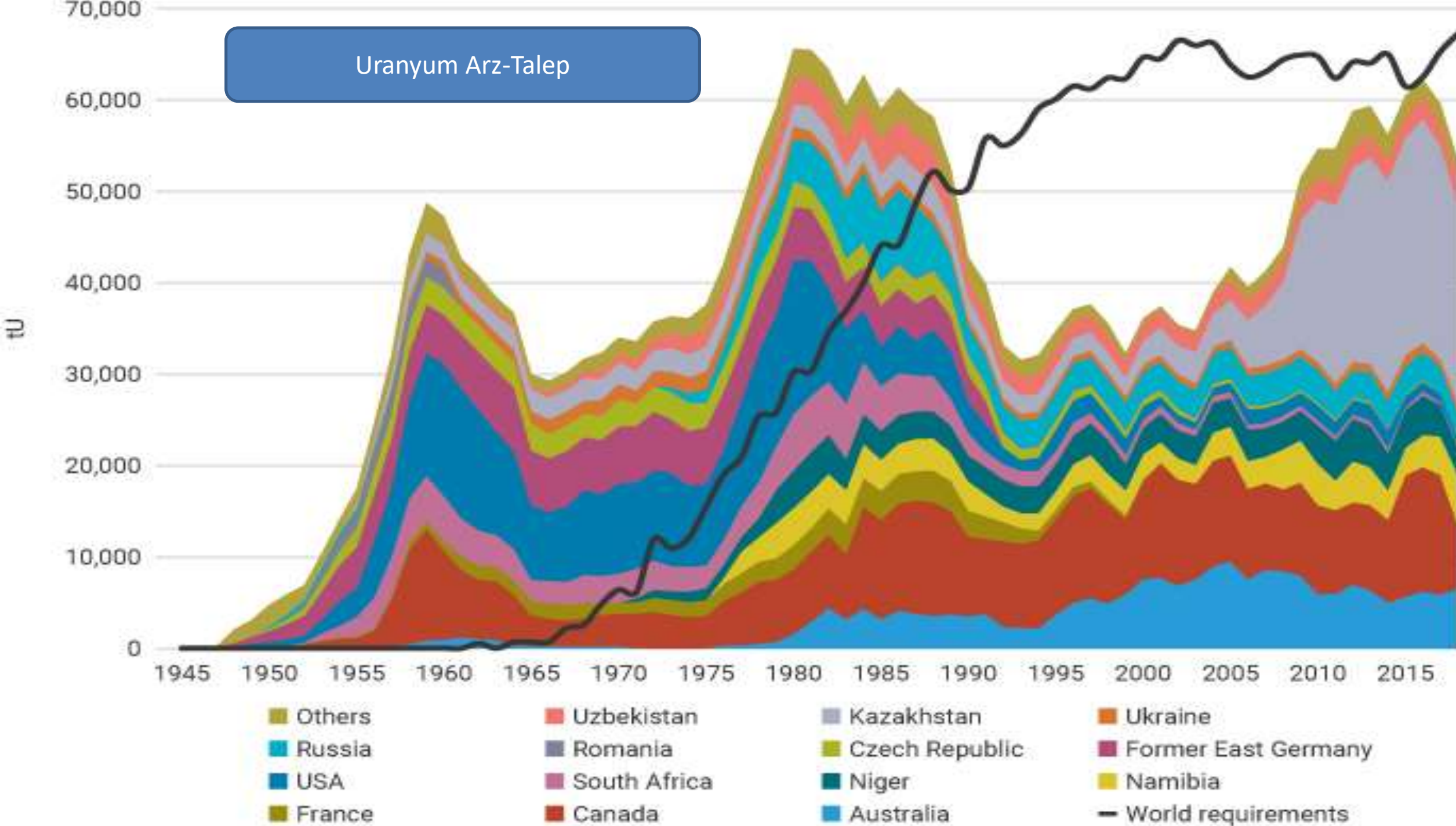
URANYUM-TORYUM ARAMA POLİTİKASI



TALEP

- %90'dan fazlası NPP
- 440 aktif reaktör, > 390 Gwe kapasite, 67 500 tU talep
- 1970'lerden bu yana tU/kw oranı 25% azaldı
- Çin ve Hindistan ile talep hızlı bir şekilde artacak
- Yeni teknolojiler sayesinde talep ivmesi azalacak

Uranyum Arz-Talep



EN BÜYÜK URANYUM MADENLERİ

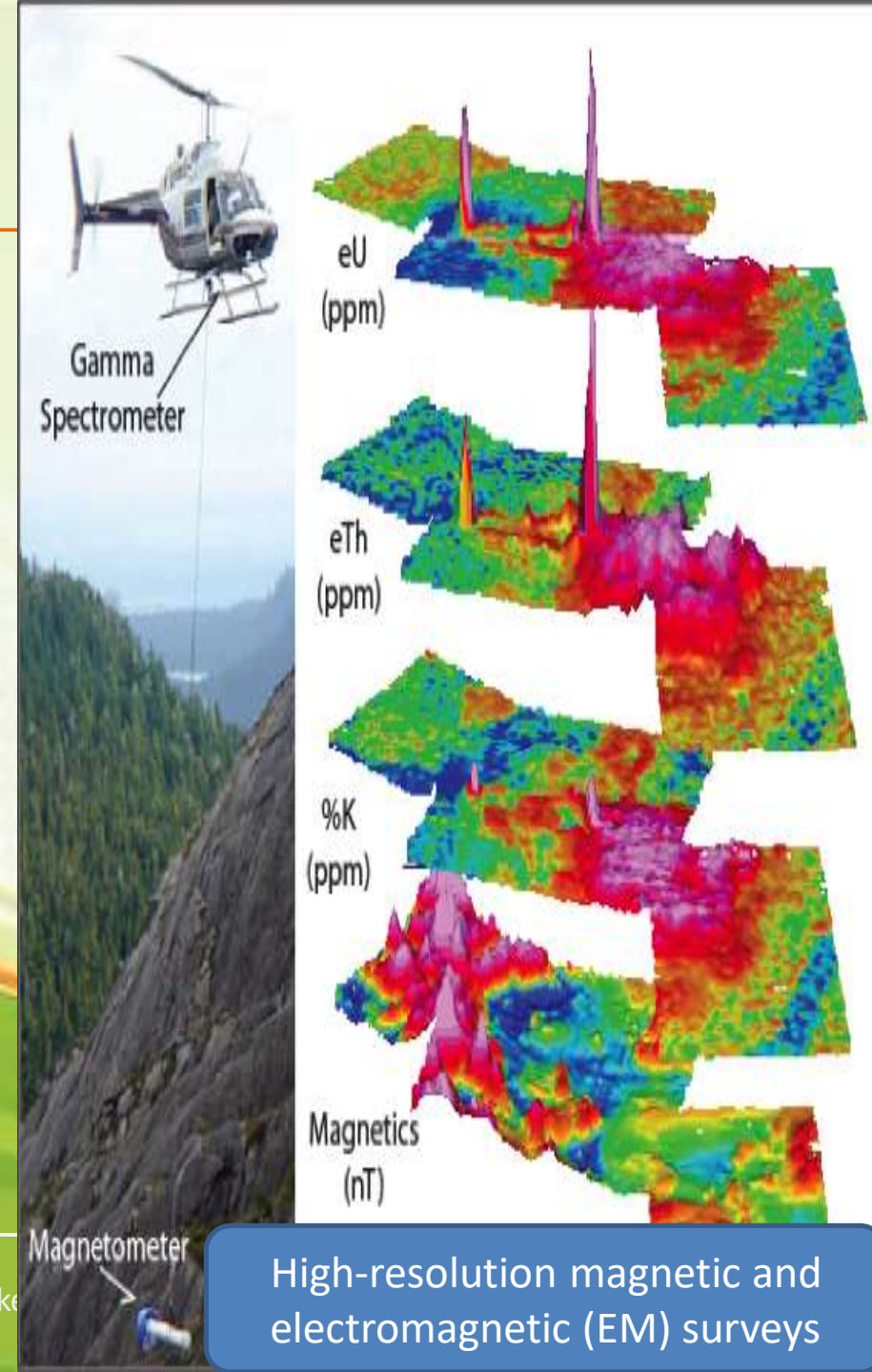
Mine	Country	Main owner	Type	Production (tonnes U)	% of world
Cigar Lake	Canada	Cameco/Orano	underground	6924	13
Husab	Namibia	Swakop Uranium (CGN)	open pit	3400	6
Olympic Dam	Australia	BHP Billiton	by-product/ underground	3364	6
Moinjum & Tortkuduk	Kazakhstan	Orano/Kazatomprom	ISL	3252	6
Inkai, sites 1-3	Kazakhstan	Kazaktomprom/Cameco	ISL	3209	6
Budenovskoye 2	Kazakhstan	Uranium One/Kazatomprom	ISL	2600	5
Rössing	Namibia	Rio Tinto	open pit	2076	4
SOMAIR	Niger	Orano	open pit	1912	4
Central Mynkuduk	Kazakhstan	Kazatomprom	ISL	1964	3
South Inkai (Block 4)	Kazakhstan	Uranium One/Kazatomprom	ISL	1601	3
Top 10 total				30,032	55%

URANYUM FİYATLARI



Arama Süreçleri

- Drone Ve Yapay Zeka Destekli Airborne Geophysical Veri Toplama Süreçleri
 - radiometric data (airborne and ground total count and spectrometric surveys)
 - radon mapping
 - artificial isotopes.
- Genel Jeoloji Ve Jeokimyasal Testler
- Nadir Toprak Elementleri Ve «Unconformity» Alanlar
- Yüzey Jeoloji Ve Jeofizik Veri Toplama Ve Yorumlama Süreçleri
- Sondaj, Testler Ve Karotlama
- Veri Yönetimi, Modelleme Ve Yorumlama
- Saha Geliştirme Planı



Kanıtlanmış Rezervler

12 614 ton uranyum (U_3O_8)

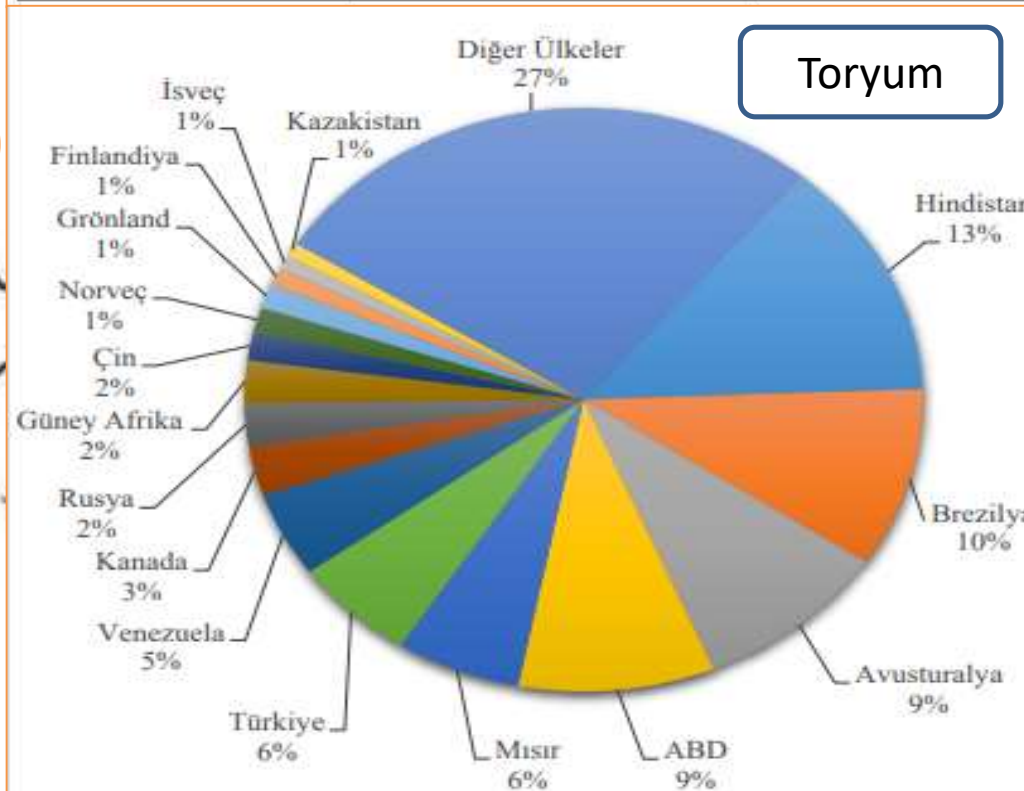
380 000 ton toryum (ThO_2)

% 0,21 ThO_2

Çözelti
Madenciliğine
Müsait

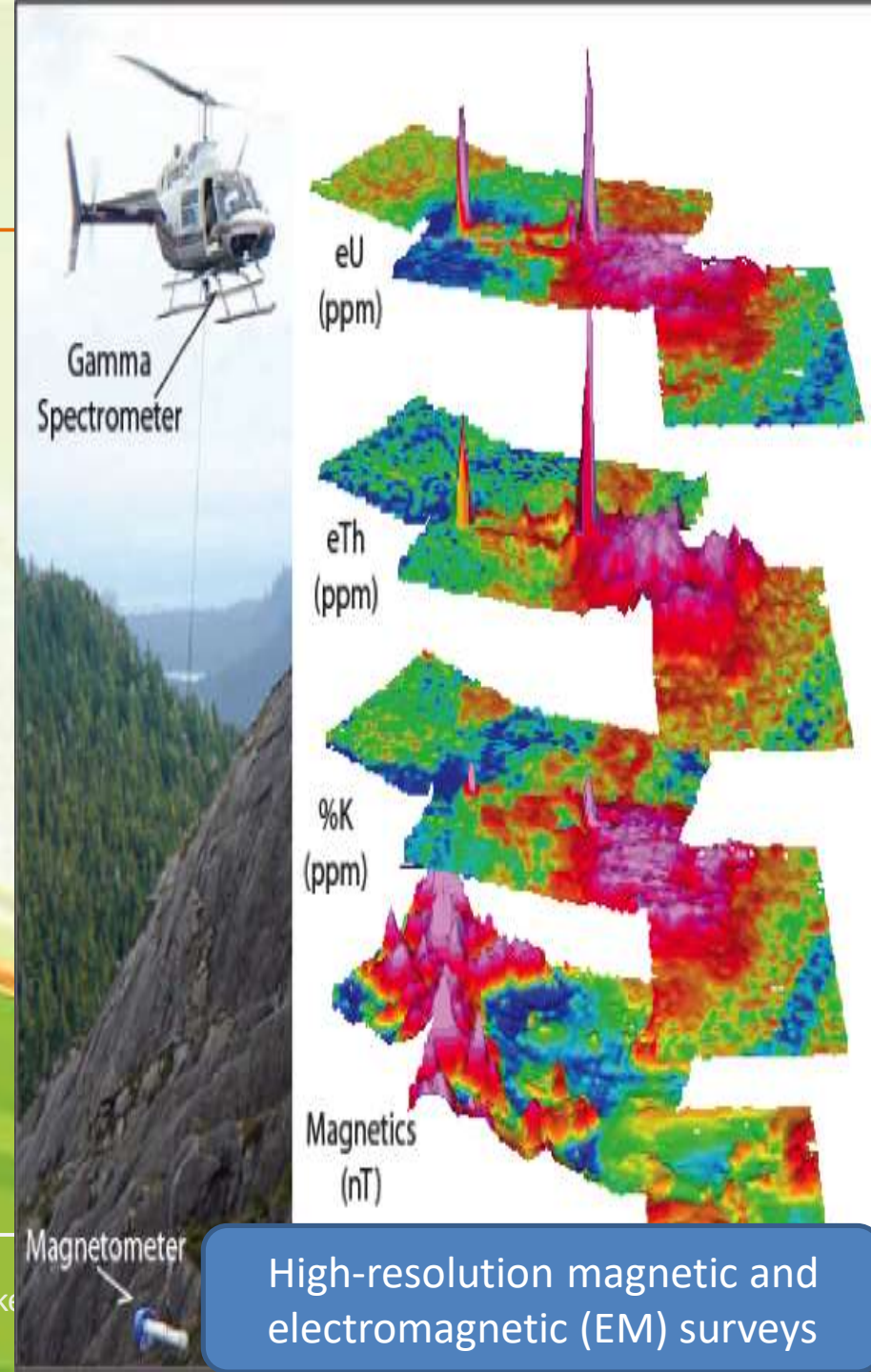
1974 yılında Köprübaşı (Manisa) cevherlerinde MTA tarafından kurulan pilot tesisler 1974-1982 yılları arasında faaliyet göstermiş, bu tesislerde Köprübaşı ve Fakılı (Uşak) yöresinde çıkarılan uranyum cevherlerinden yaklaşık 1200 kg sarı pasta üretilmiş ve 1996 yılında da TAEK'e teslim edilmiştir

Bölge	TENÖR (% U_3O_8)	REZERV (ton)
Manisa - Köprübaşı	0,04 - 0,07	3.487
Uşak-Eşme-Fakılı	0,05	490
Yozgat-Sorgun	0,1	6.700
Aydın-Küçükçavdar	0,04	208
Aydın-Demirtepe	0,08	1.729
TOPLAM		12.614

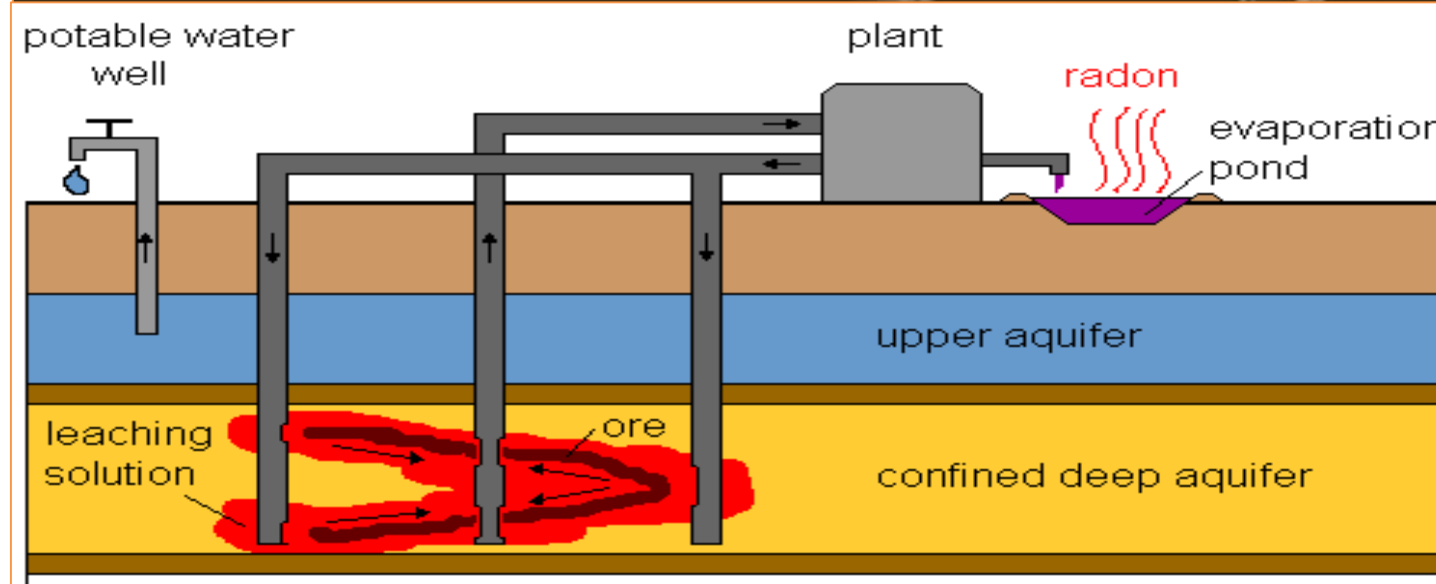
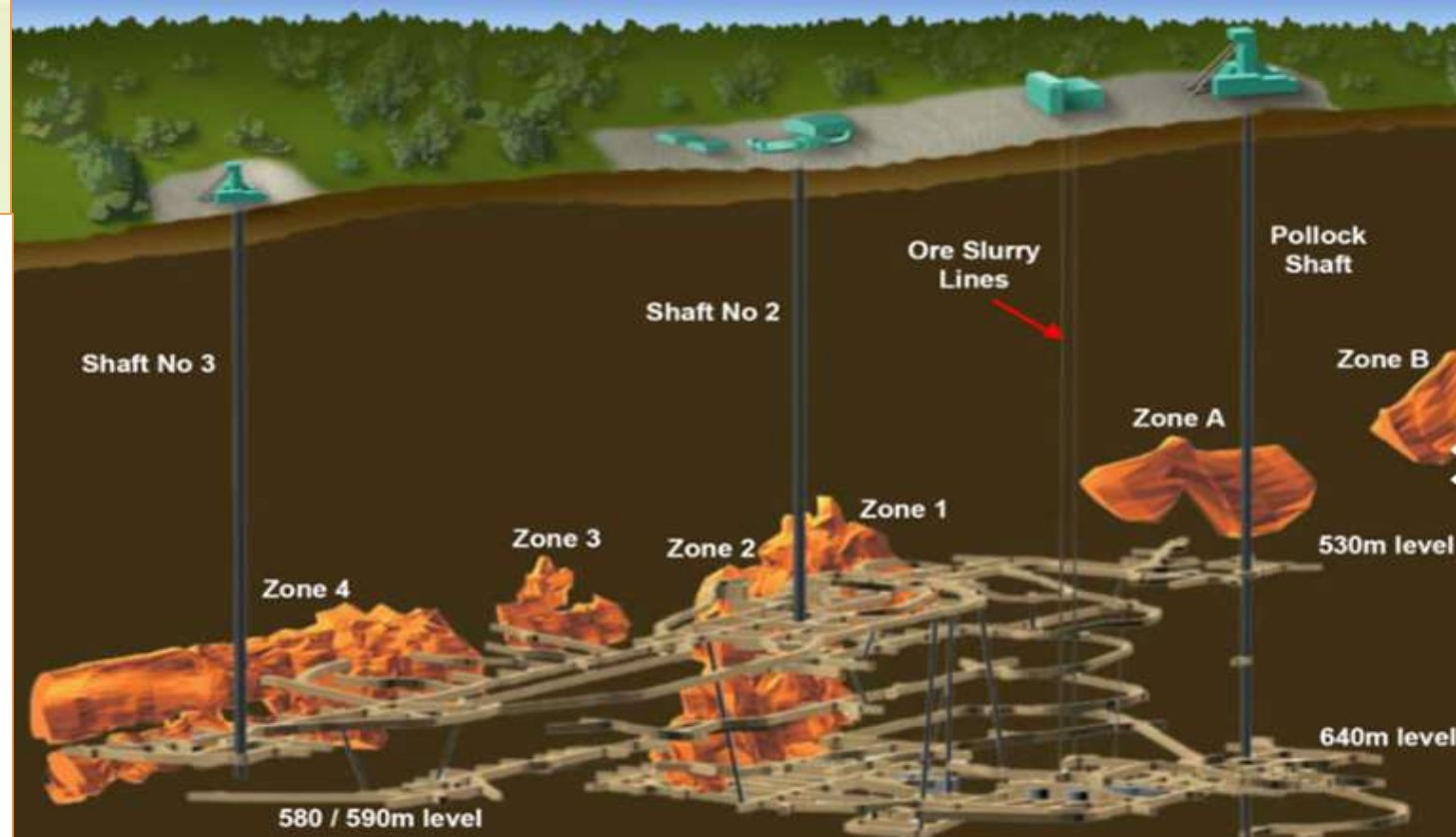
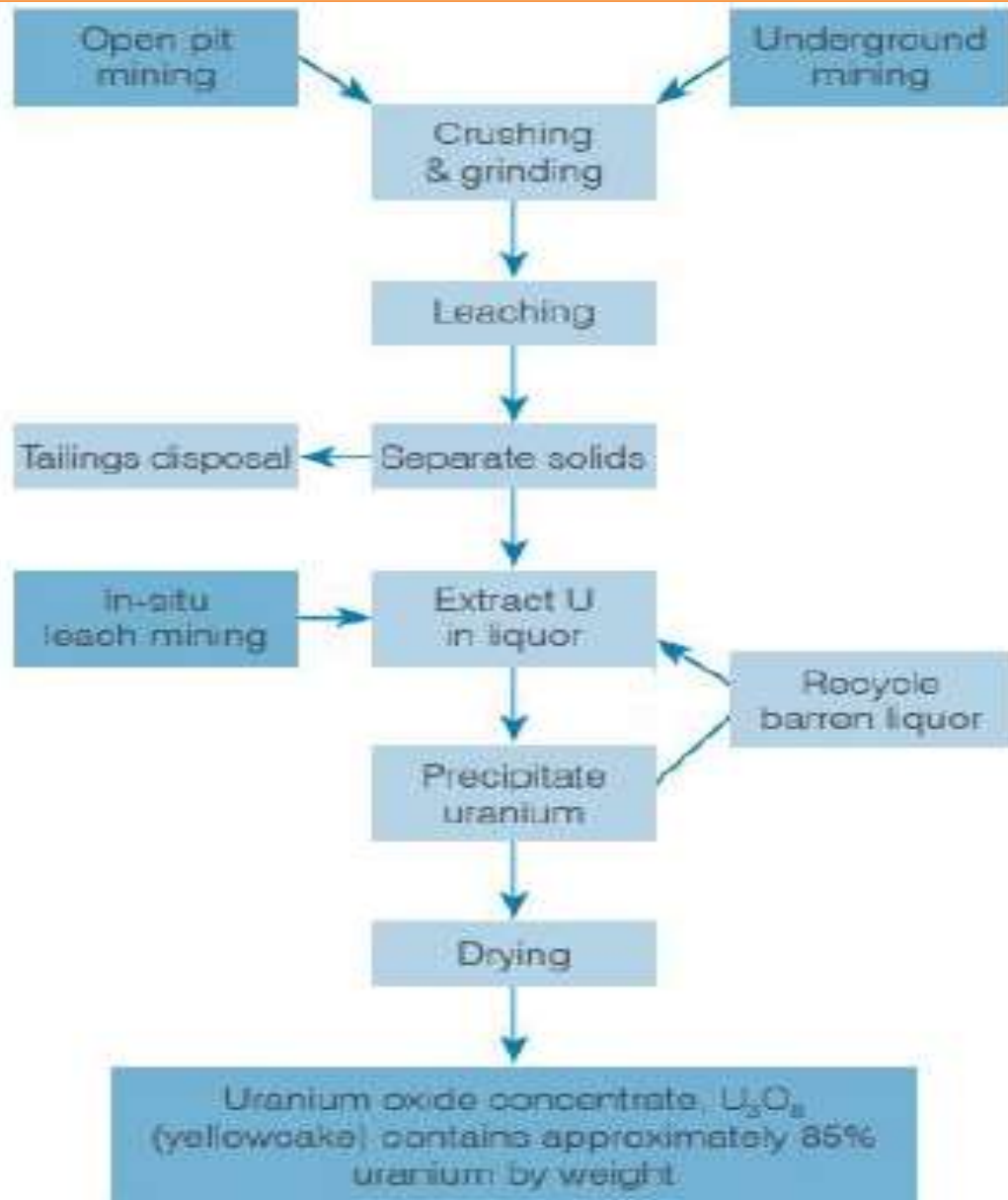


Bazı Öneriler

- Yurtdışı girişimler
- Entegre arama ve yer bilimleri veri sistemi
- Su kaynaklarının analizleri ve aynı sistemde incelenmesi
- Uranyum ve toryum uzmanları yetiştirme
- Drone ve yapay zeka destekli airborne geophysical veri toplama süreçleri
- Arama sürecinde özel testler için teşvik ve bütçe ayırma
- Saha bazlı özel modelleme ve rezervuar yönetimi ekipleri oluşturma
- Zenginleştirme çalışmaları
- TÜRK ENERJİ BİRLİĞİ
- Uranyum depolama
- Atık yönetim sistemleri ve mini nükleer reaktör teknolojilerine yatırım



Açık Üretim
Kapalı Üretim
Asit/Alkali Leaching





In 2016, 48% of the world's mined uranium was from ISR operations.



Most uranium mining in the USA, Kazakhstan, and Uzbekistan is by ISR.



Gold, copper, and uranium can also be extracted using the ISR method.



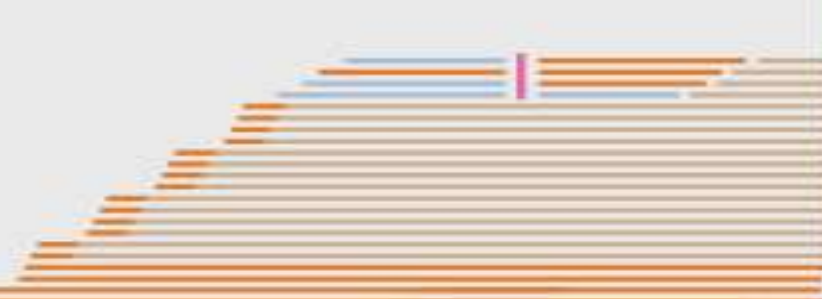
ISR is the most cost effective and environmentally friendly method of mining.

UNDERGROUND MINING



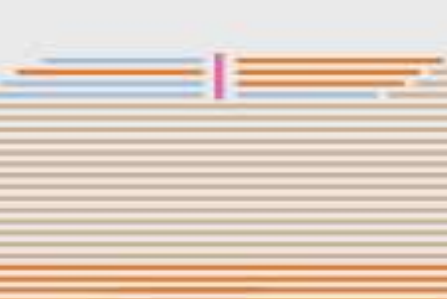
More expensive and often used to reach deeper deposits.

SURFACE MINING



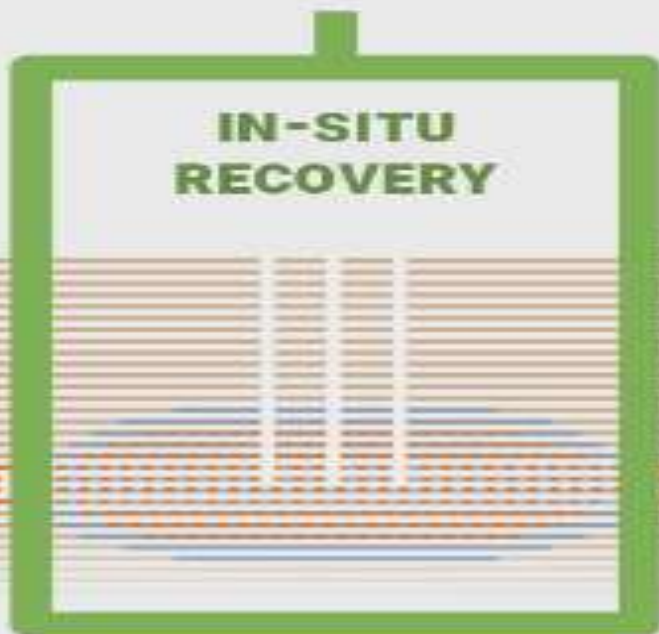
Typically used for more shallow and less valuable deposits.

PLACER MINING



Used to sift out valuable metals from sediments in river channels, beach sands, or other environments.

IN-SITU RECOVERY



Involves dissolving the mineral resource in place then processing it at the surface without moving a