

CSIS

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**The
Changing Geopolitics of
Energy – Part V**

**Regional Developments in the FSU, Russia,
Central Asia, and Caspian**

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**Strategic Energy Initiative
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Energy Issues Affecting Russia and the FSU

Key Issues Affecting the FSU

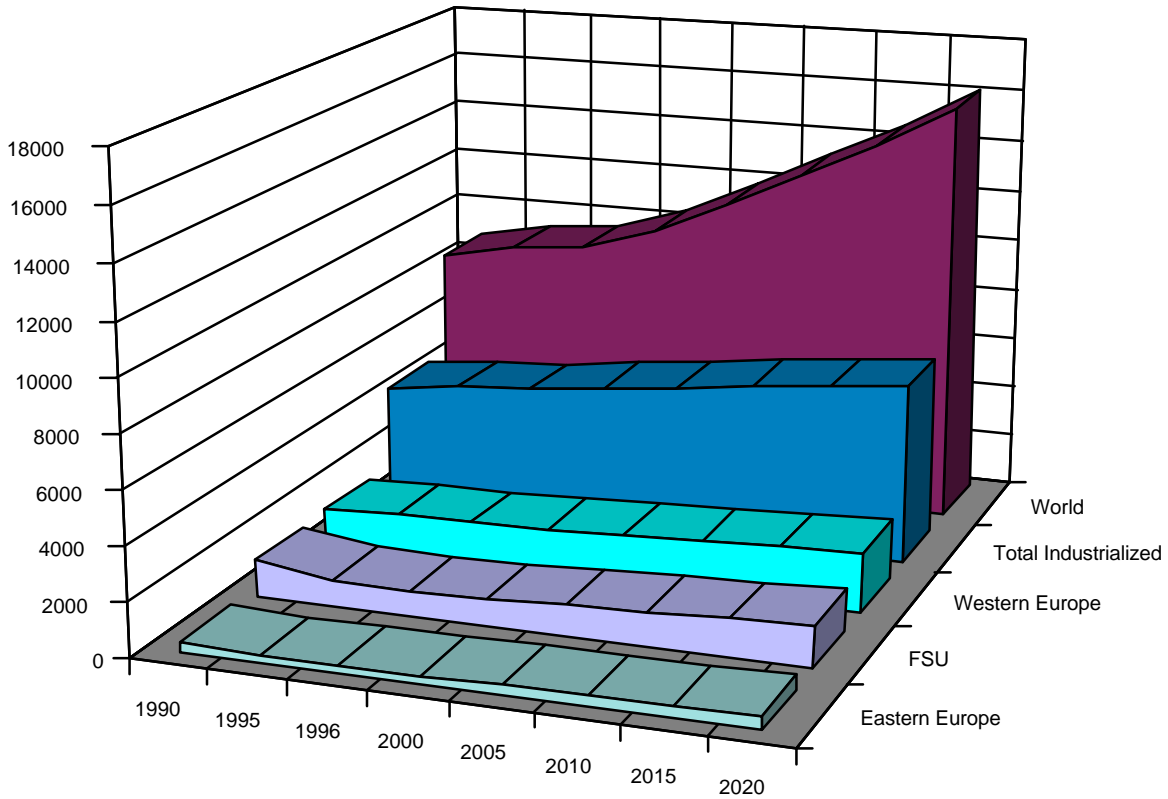
- **Internal Stability and Local Rivalries: The “Near Abroad.”**
- **Reemergence of the “Great Game.”**
- **Efficient markets; Investment in energy.**
- **New Pipelines and Export Routes.**
- **Production versus Domestic Demand: The Future Export Surplus.**
- **Unsafe Nuclear Power.**
- **Major Environmental Problems.**

Energy Profile: FSU, Eastern Europe, and Western Europe During 1990-2020

<u>Fuel Use</u>	<u>1990</u>	<u>1996</u>	<u>2000</u>	<u>2005</u>	<u>2010</u>	<u>2015</u>	<u>2020</u>	% of Annual Change
<u>1995-2015</u>								
<u>Oil Use in MMBD</u>								
FSU	8.4	4.4	4.4	5.1	5.9	6.7	7.5	1.9
Eastern Europe	1.6	1.3	1.5	1.6	1.9	2.2	2.6	2.9
Western Europe	12.9	14.3	14.3	14.6	14.9	15.2	15.4	0.3
<u>Natural Gas Use in TCF</u>								
FSU	25.0	20.7	23.0	26.2	29.6	32.2	35.4	2.2
Eastern Europe	3.1	2.9	3.8	4.8	5.6	6.5	7.3	4.0
Western Europe	10.3	14.1	16.2	19.9	23.5	27.7	32.1	3.8
<u>Coal Use in Millions of Short Tons</u>								
FSU	848	472	499	496	490	477	462	-0.4
Eastern Europe	523	413	420	422	396	370	343	-0.9
Western Europe	958	671	679	670	676	681	686	0.1
<u>Nuclear Use in Billions of Kilowatts</u>								
FSU	201	194	185	202	211	214	206	0.7
Eastern Europe	54	60	62	69	68	64	55	-0.1
Western Europe	703	824	841	821	763	674	588	-1.2
<u>Hydroelectric and Renewable Consumption in Quadrillions of BTU</u>								
FSU	2.4	2.2	2.6	2.9	3.1	3.2	3.4	1.3
Eastern Europe	0.4	0.6	0.5	0.7	1.0	1.4	1.7	4.5
Western Europe	4.6	4.9	5.8	6.6	7.4	8.0	8.7	2.1
<u>Electricity Generation in Billions of Kilowatts</u>								
FSU	1,488	1,133	1,108	1,236	1,366	1,472	1,586	1.2
Eastern Europe	420	401	401	449	515	584	662	2.2
Western Europe	2,115	2,330	2,720	3,064	3,419	3,781	4,182	2.4
<u>Carbon Emissions in Millions of Metric Tons</u>								
FSU	991	613	653	720	792	850	913	1.5
Eastern Europe	299	228	249	266	280	293	310	1.2
Western Europe	971	947	978	1,037	1,101	1,279	1,239	1.2

Source: Adapted by Anthony H. Cordesman from EIA, International Energy Outlook, 1998, DOE/EIA-0484 (97), April 1998, pp. 136-142.

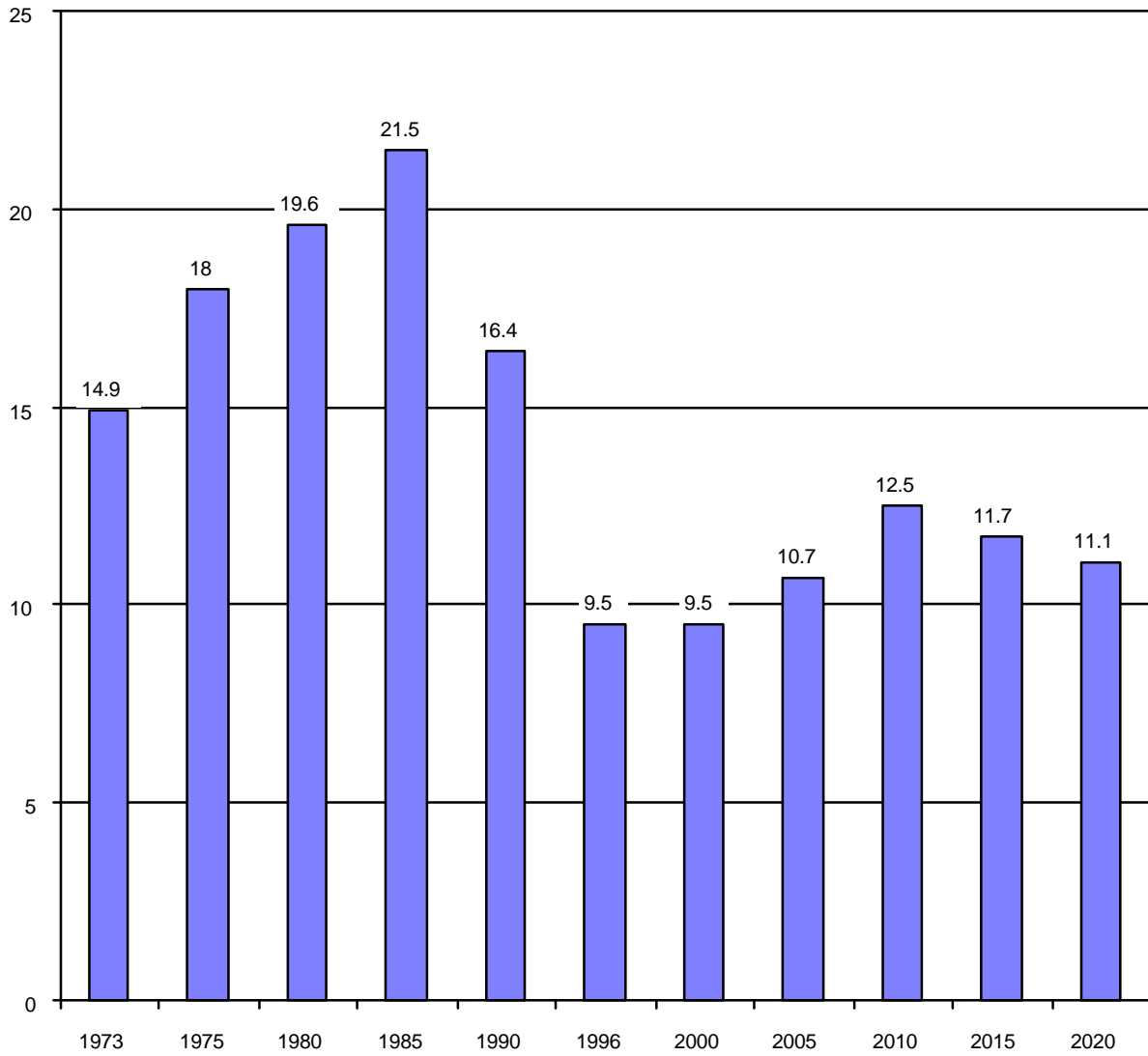
The Impact of the FSU on Total Global Energy Use of All Kinds (in Millions of Tons of Oil Equivalent: 1990-2020)



	1990	1995	1996	2000	2005	2010	2015	2020
Eastern Europe	382	312	316	345	381	416	453	492
FSU	1473	1027	1003	1073	1196	1322	1424	1533
Western Europe	1561	1632	1681	1757	1878	1991	2103	2221
Total Industrialized	4654	5018	5187	5490	5866	6241	6543	6842
World	8663	9212	9478	10408	11736	13095	14504	16112

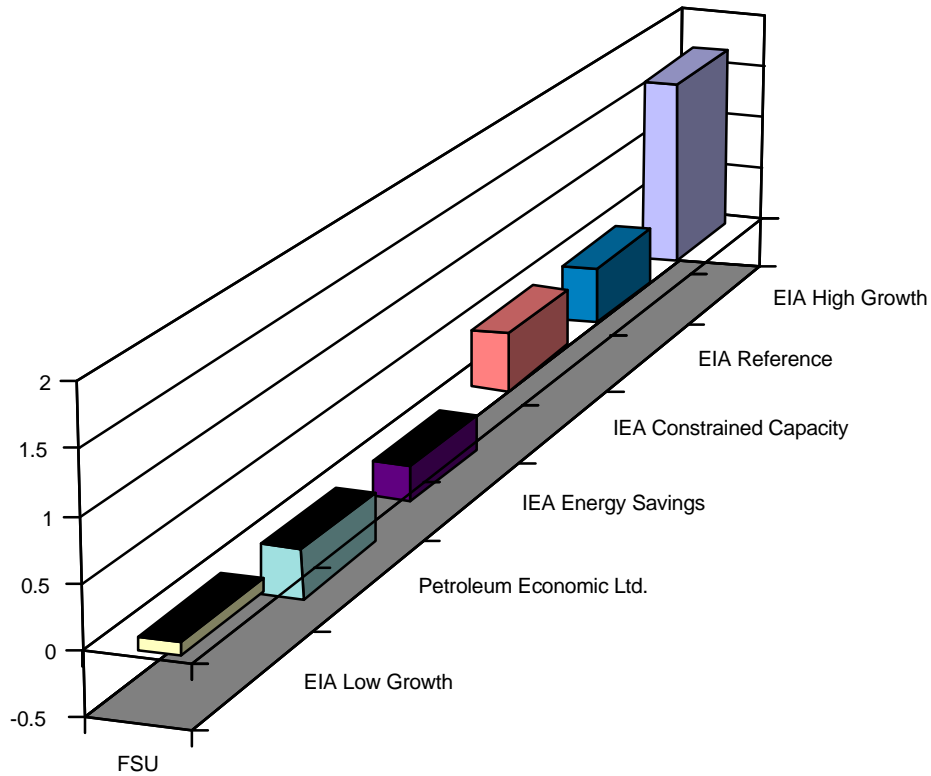
Source: Adapted by Anthony H. Cordesman from the “reference case” EIA, International Energy Outlook, 1998, DOE/EIA-0484(97), p. 146.

**The Impact of Stability in the FSU:
Estimated FSU Oil Production As Percent of World Supply**
(EIA Reference Case, 1997)



Source: Adapted by Anthony H. Cordesman from EIA, International Energy Outlook, 1998, DOE/EIA-0484 (97), April 1998, pp. 175, and EIA, Monthly Energy Review, April, 1997, pp. 130-131.

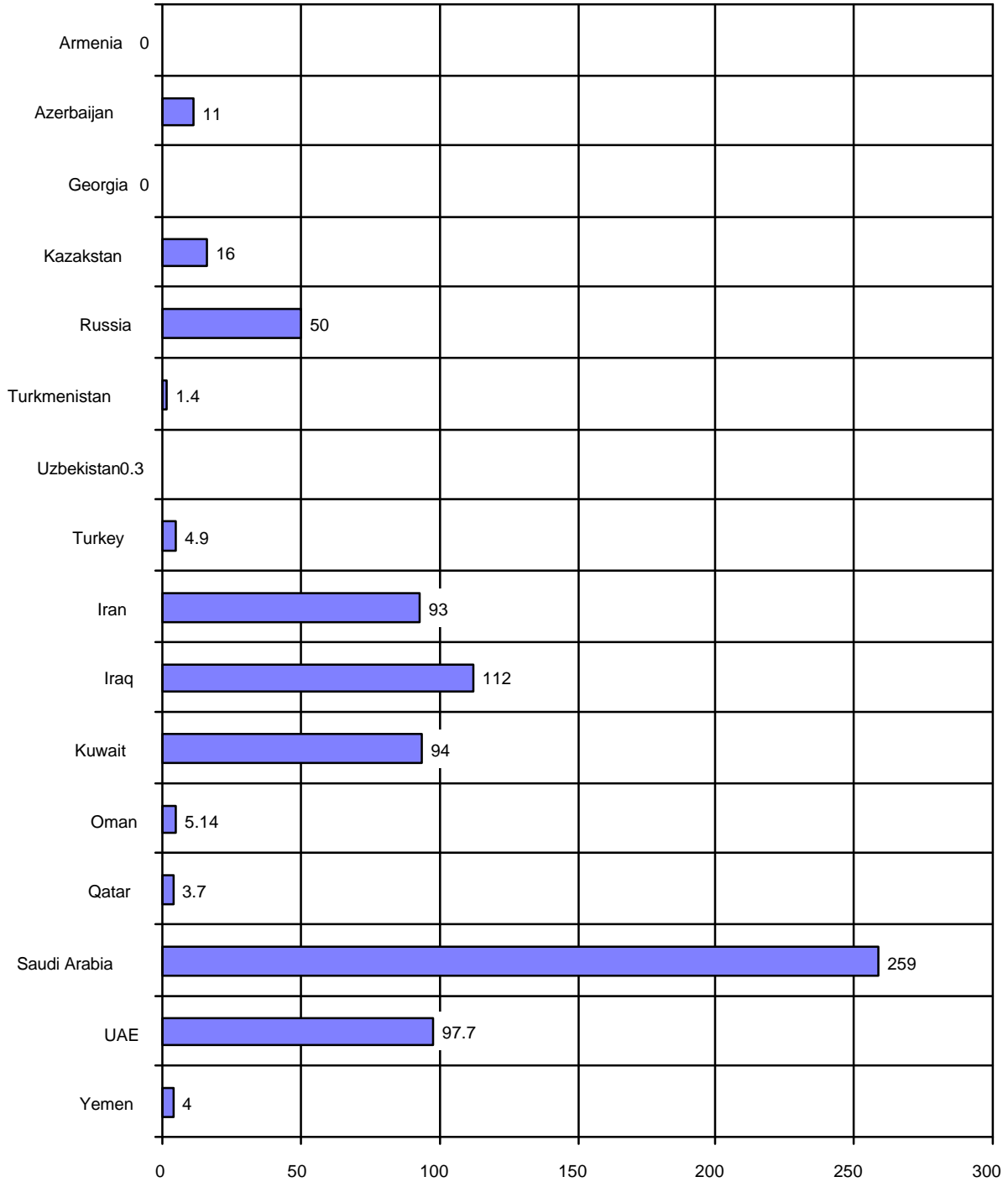
The Uncertainty Factor in FSU and Eastern European Recovery: Comparative Estimated Near-Term Average Annual Increase in Percent in Domestic Demand for Energy: 1990-2020



	FSU
EIA Low Growth	-0.1
Petroleum Economic Ltd.	-0.4
IEA Energy Savings	-0.3
IEA Constrained Capacity	0.5
EIA Reference	0.5
EIA High Growth	1.7

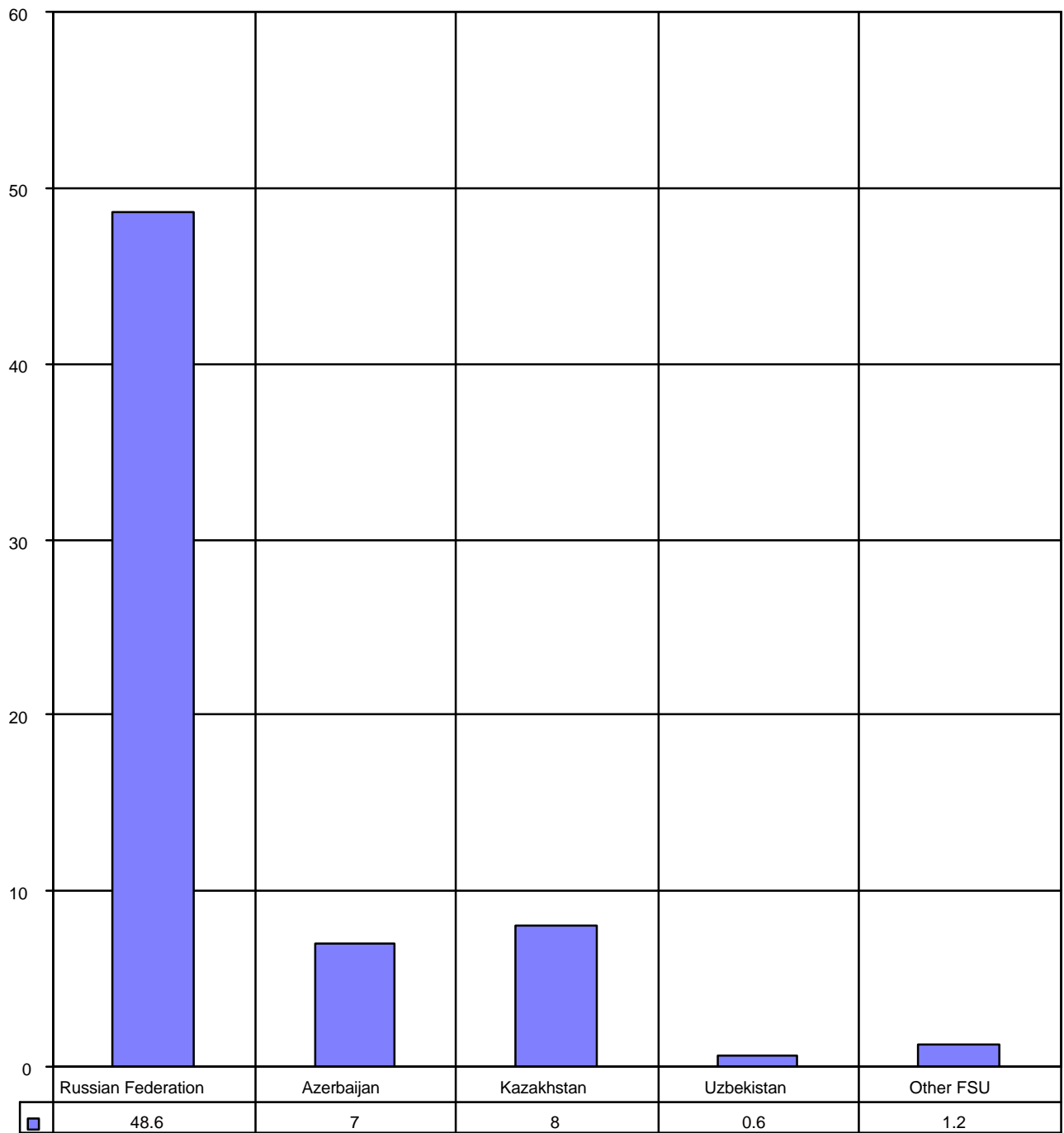
Source: Adapted by Anthony H. Cordesman from the "reference case" EIA, International Energy Outlook, 1998, DOE/EIA-0484(97), p. 21.

The Uncertainty Factor: Comparative Oil Reserves in the FSU versus the Gulf



Source: Adapted by Anthony H. Cordesman from material in the Oil and Gas Journal, the API data bases, and EIA data base.

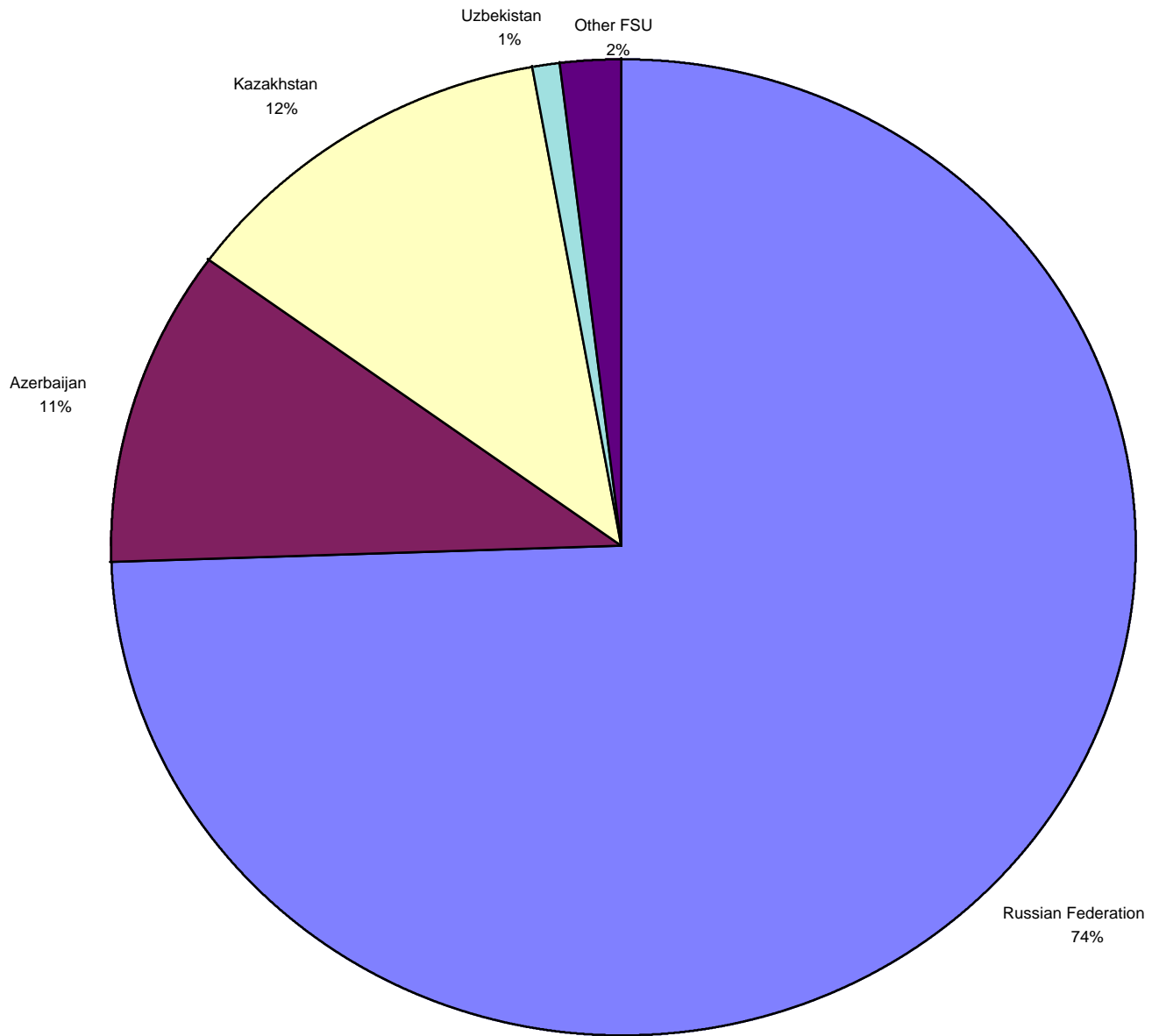
BP Estimate of the Oil Reserves of the FSU by Country
 (in Billions of Barrels: 1997)



Source: Adapted by Anthony H. Cordesman from BP Statistical Review of World Energy, June, 1998, pp. 4-5.

BP Estimate of the Oil Reserves of the FSU by Country

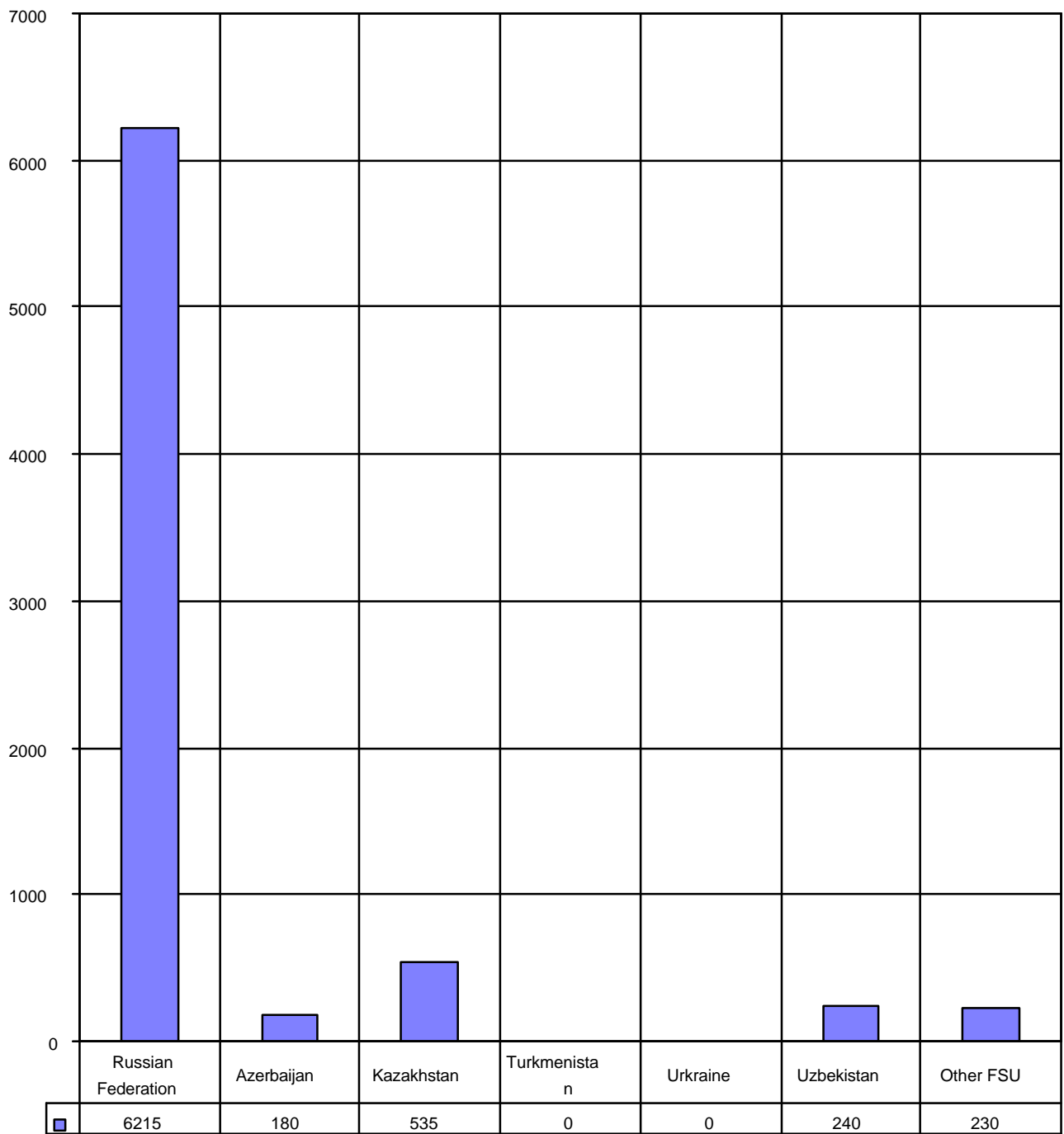
(in Billions of Barrels: 1997)



Source: Adapted by Anthony H. Cordesman from BP Statistical Review of World Energy, June, 1998, pp. 4-5.

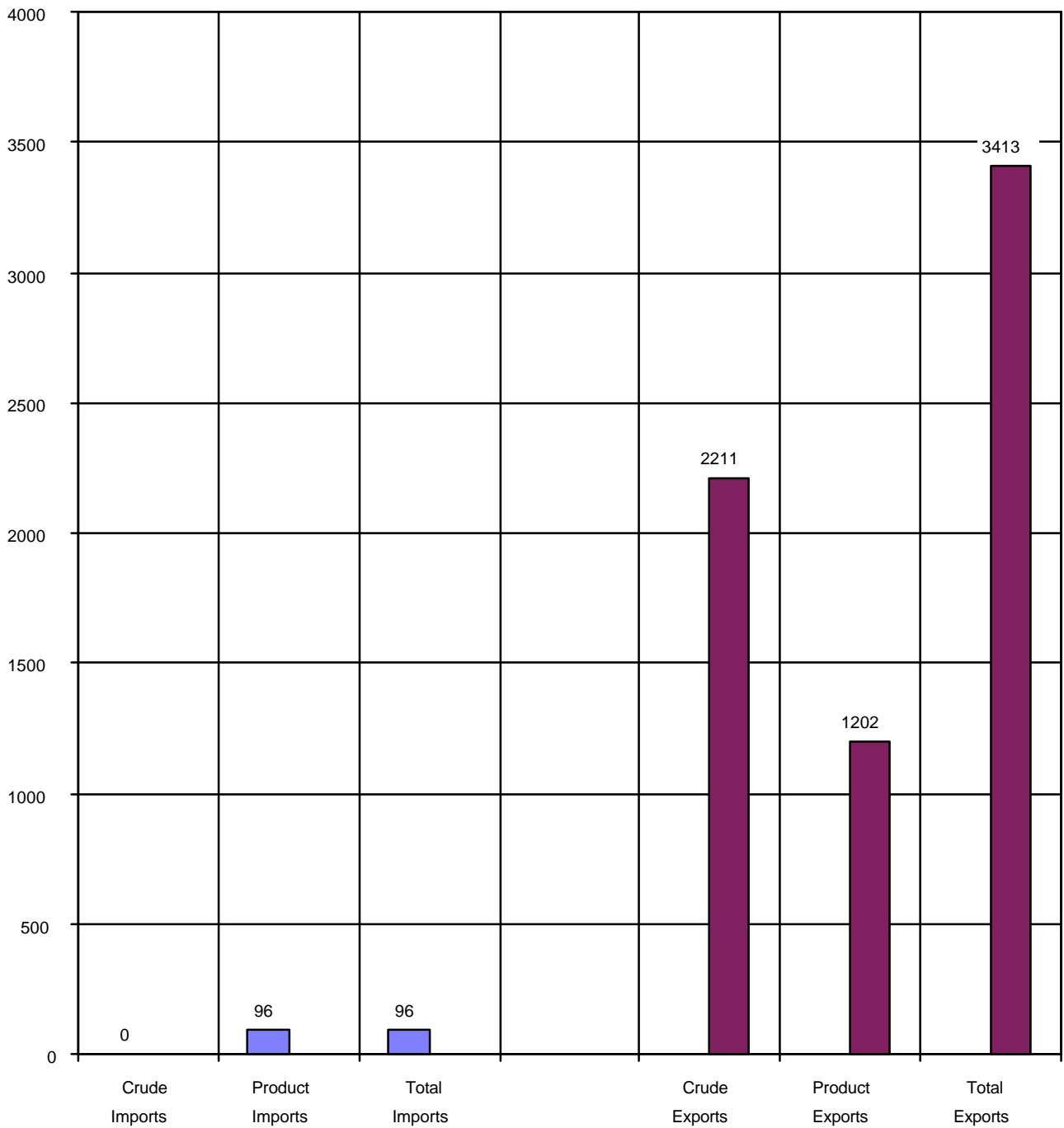
BP Estimate of FSU Oil Production by Country

(in Thousands of Barrels per Day: 1997)



Source: Adapted by Anthony H. Cordesman from BP Statistical Review of World Energy, June, 1998, pp. 6-7.

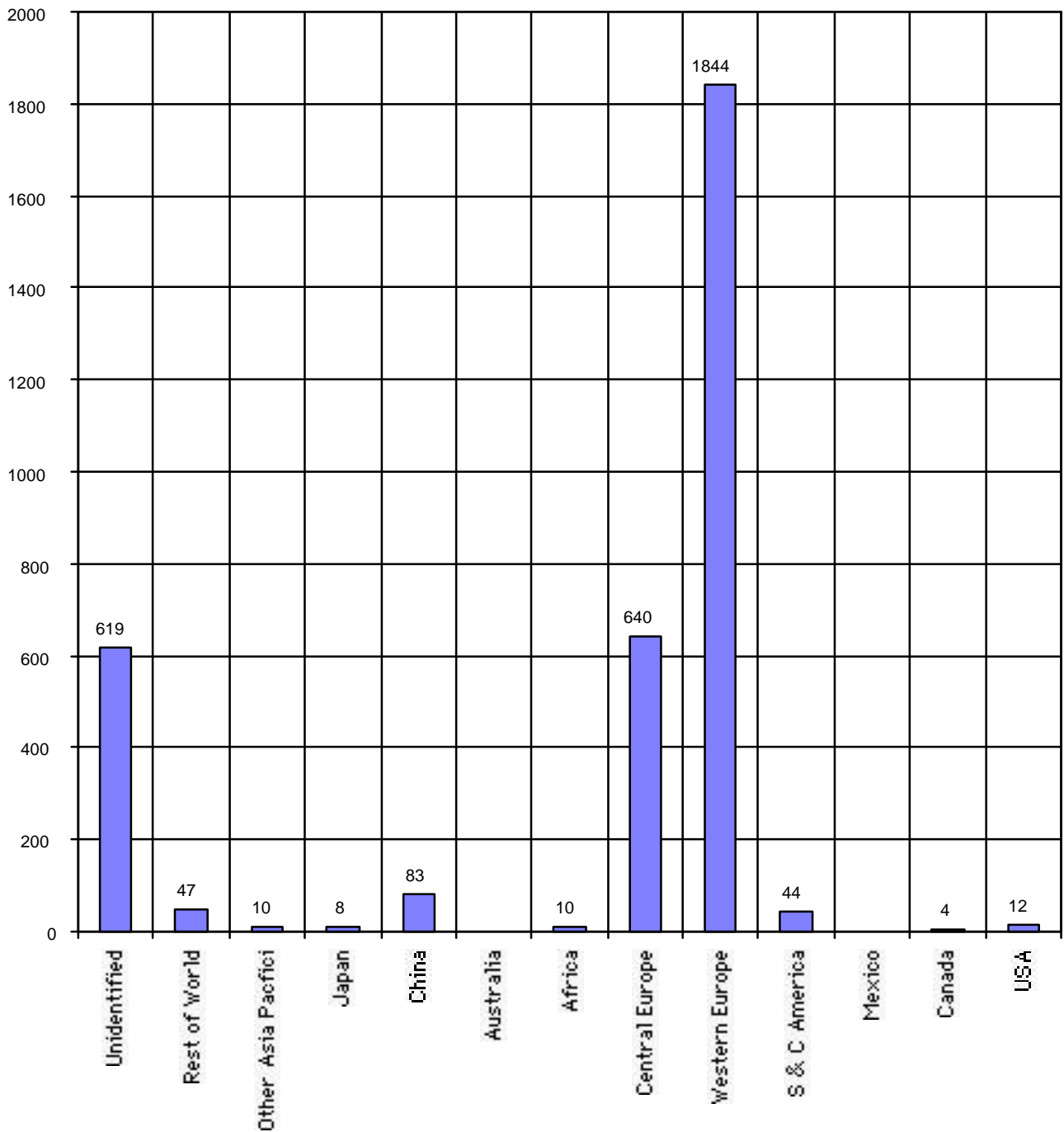
BP Estimate of FSU Oil Exports by Category (in Thousands of Barrels Per Day: 1997)



Total oil exports = 3,413 thousand barrels per day.

Source: Adapted by Anthony H. Cordesman from BP Statistical Review of World Energy, June, 1998, pp. 18-19.

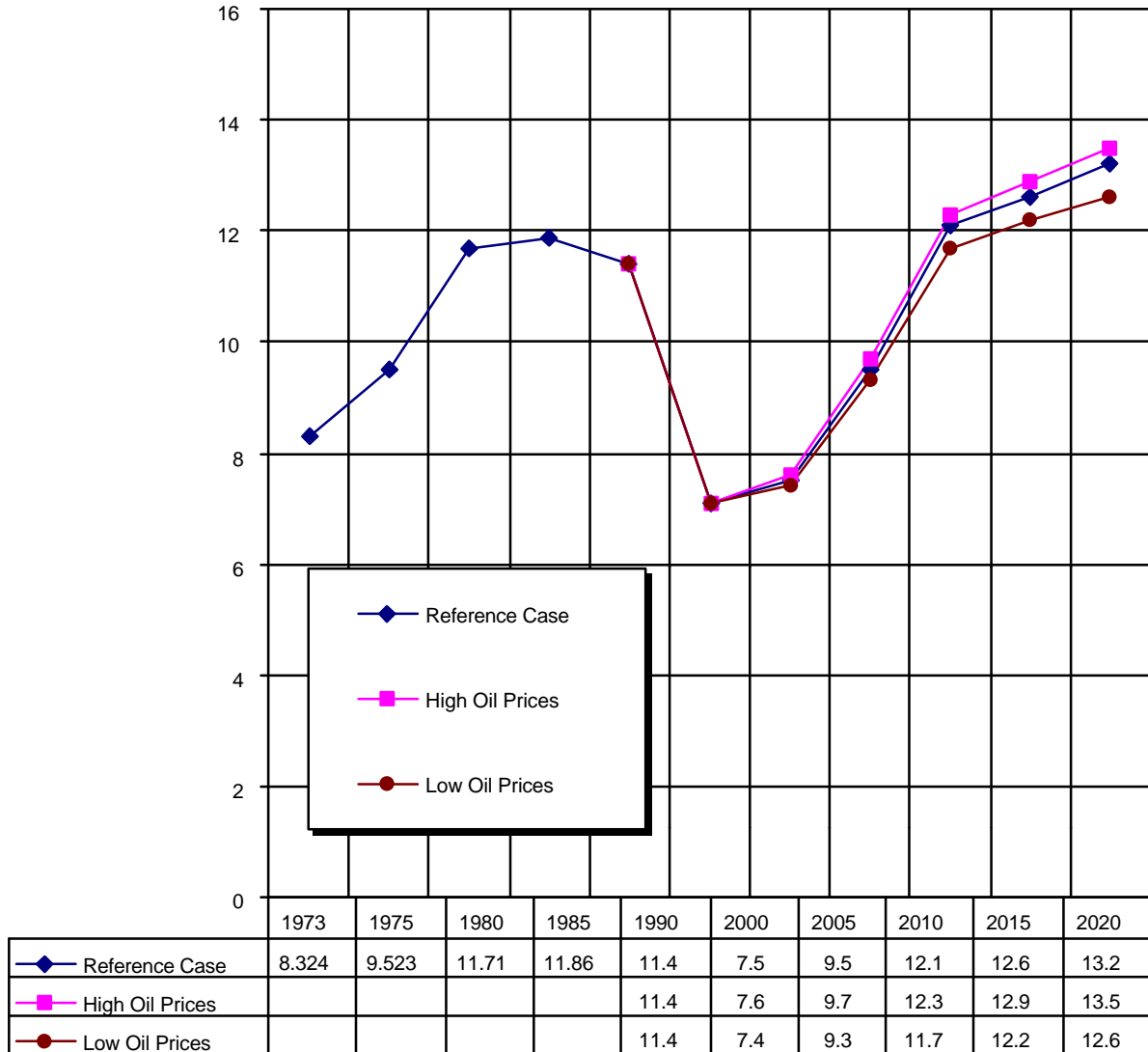
BP Estimate of FSU Oil Exports by Region and Country of Destination
 (in Thousands of Barrels Per Day: 1997)



Total oil exports = 3,413 thousand barrels per day.

Source: Adapted by Anthony H. Cordesman from BP Statistical Review of World Energy, June, 1998, pp. 18-19.

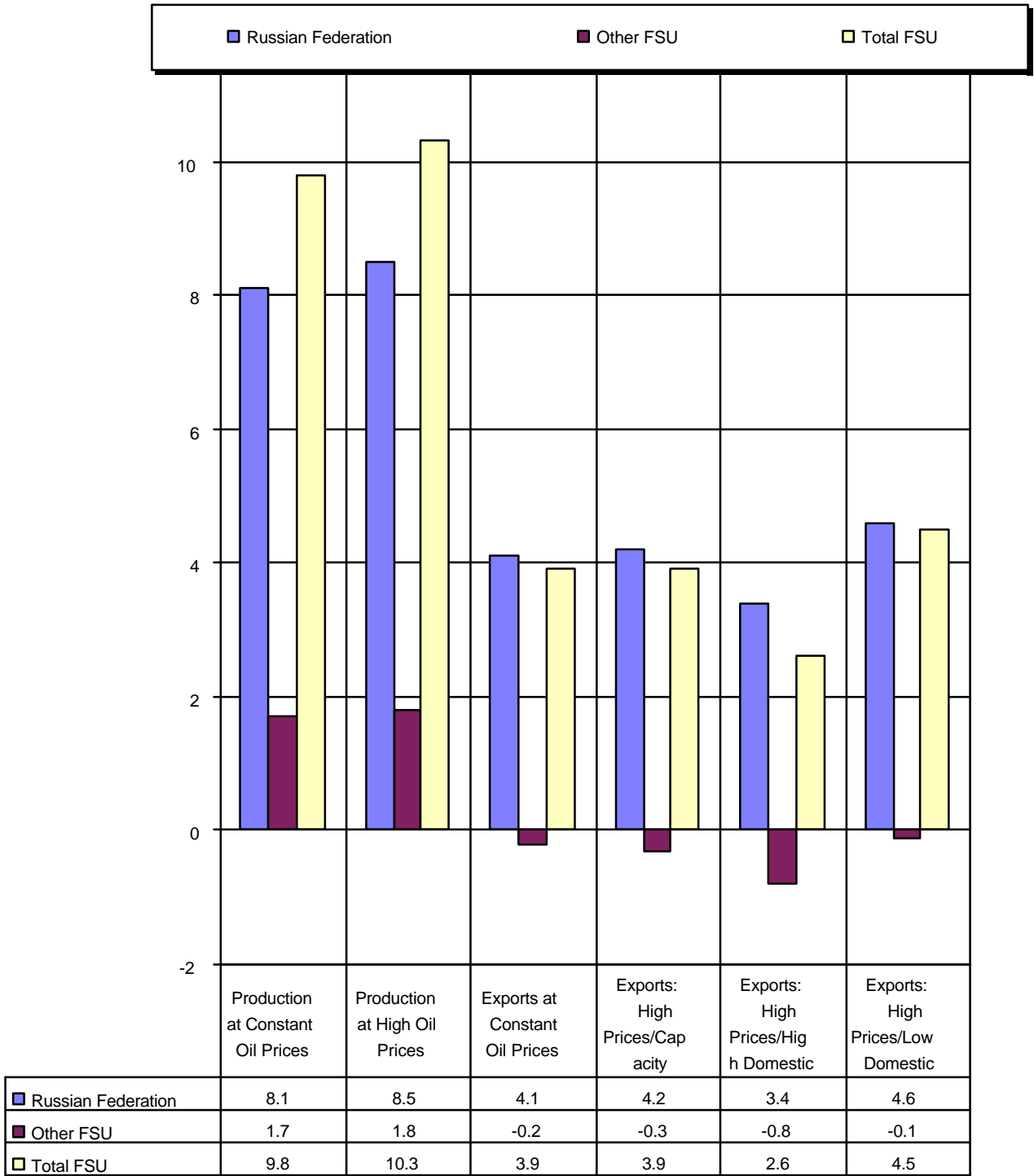
The Impact of Stability in the FSU: Estimated FSU Oil Production Capacity (In MMB/D)



Source: Adapted by Anthony H. Cordesman from EIA, International Energy Outlook, 1998, DOE/EIA-0484 (97), April 1998, pp. 175-177, and EIA, Monthly Energy Review, April, 1997, pp. 130-131.

IEA/OECD Estimate of Possible Levels of Oil Production and Export Capacity in the FSU in 2010

(IEA Estimate in MMBD)



Source: Adapted by Anthony H. Cordesman from IEA, *World Energy Outlook, 1996*, pp. 153-158.

IEA/OECD Estimate of Oil Supply and Demand in the FSU in 2010

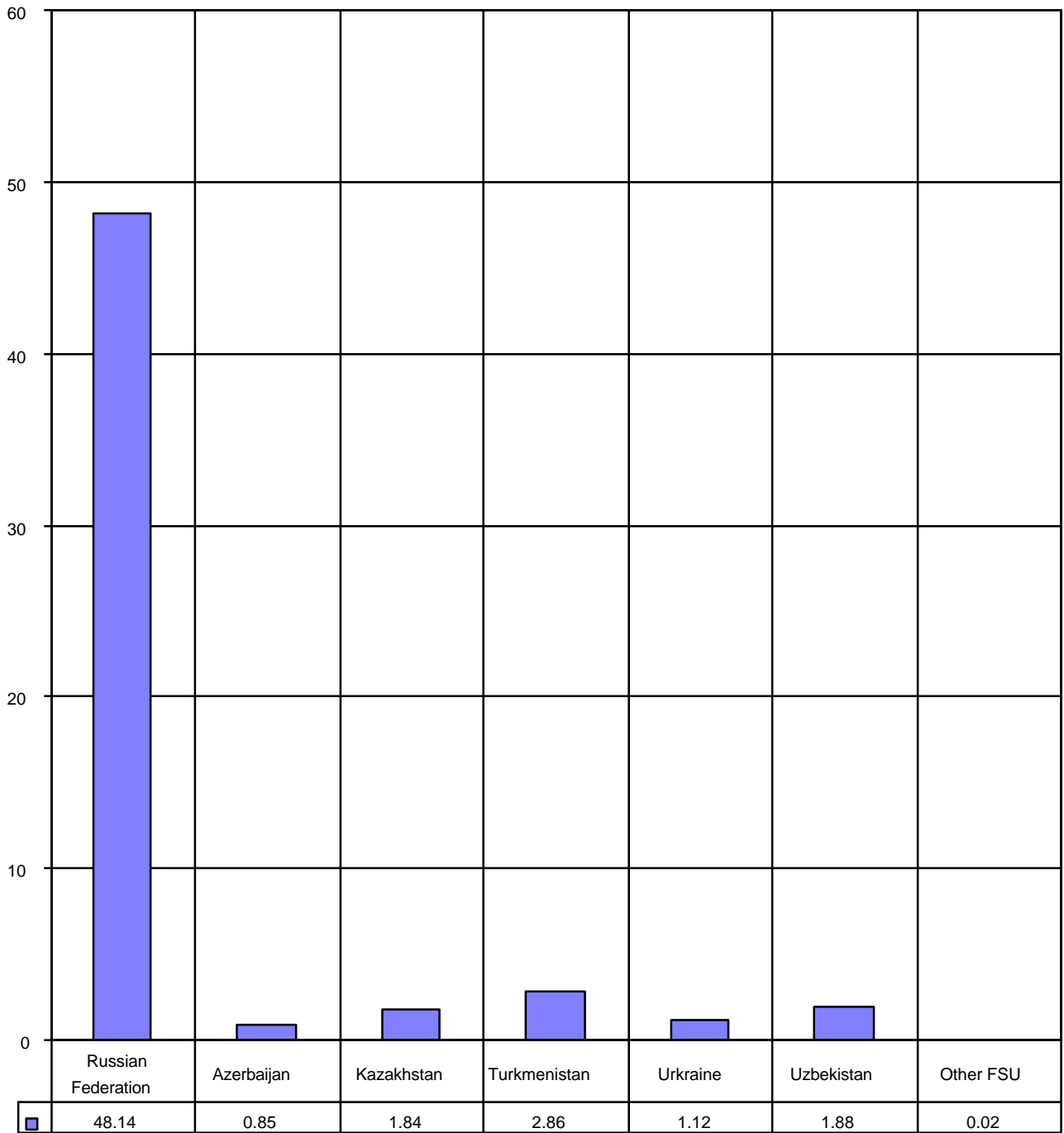
(IEA Estimate in MMBD)

<u>Case</u>	<u>Russian Federation</u>	<u>Other FSU</u>	<u>Total FSU</u>
<u>Constant Oil Prices</u>			
Production	8.1	1.7	9.8
Domestic Demand	4.0	1.9	5.9
Next Exports	4.1	-0.2	3.9
<hr/>			
<u>Rising Oil Prices</u>			
Production	8.5	1.8	10.3
<hr/>			
<i>Capacity Constraints</i>			
Domestic Demand	4.3	2.1	6.4
Next Exports	4.2	-0.3	3.9
<hr/>			
<i>High Growth Constraints</i>			
Domestic Demand	5.1	2.6	7.7
Next Exports	3.4	-0.8	2.6
<hr/>			
<i>Low Growth Constraints</i>			
Domestic Demand	3.9	1.9	5.8
Next Exports	4.6	-0.1	4.5

Note: FSU domestic oil demand is assumed to increase to 4.9-5.2 MMBD by 2000, with demand rising by an average annual rise of 1.7-4.1% during 2000-201, driven largely by the transport section. By 2010, domestic oil demand could be 5.8-7.7 MMBD. Oil production for the entire FSU is projected to rise from around 7.0 MMBD to 9.8-10.3 MMBD by 2010. Russian oil production is projected to rise modestly from 6.2 MMBD in 1995 through 2000, and then rising to 8.1-8.5-MMBD. This is a higher estimate than Russia gives, which is 5.4-6.2 MMBD in 2000 and 5.6-7.0 MMBD in 2010. The other republics are projected to rise from about 1 MMBD in 1995 (largely Karakstan and Azerbaijan) to 1.8 MMBD in 2010. This would produce net exports of 2.1-4.0 MMBD.

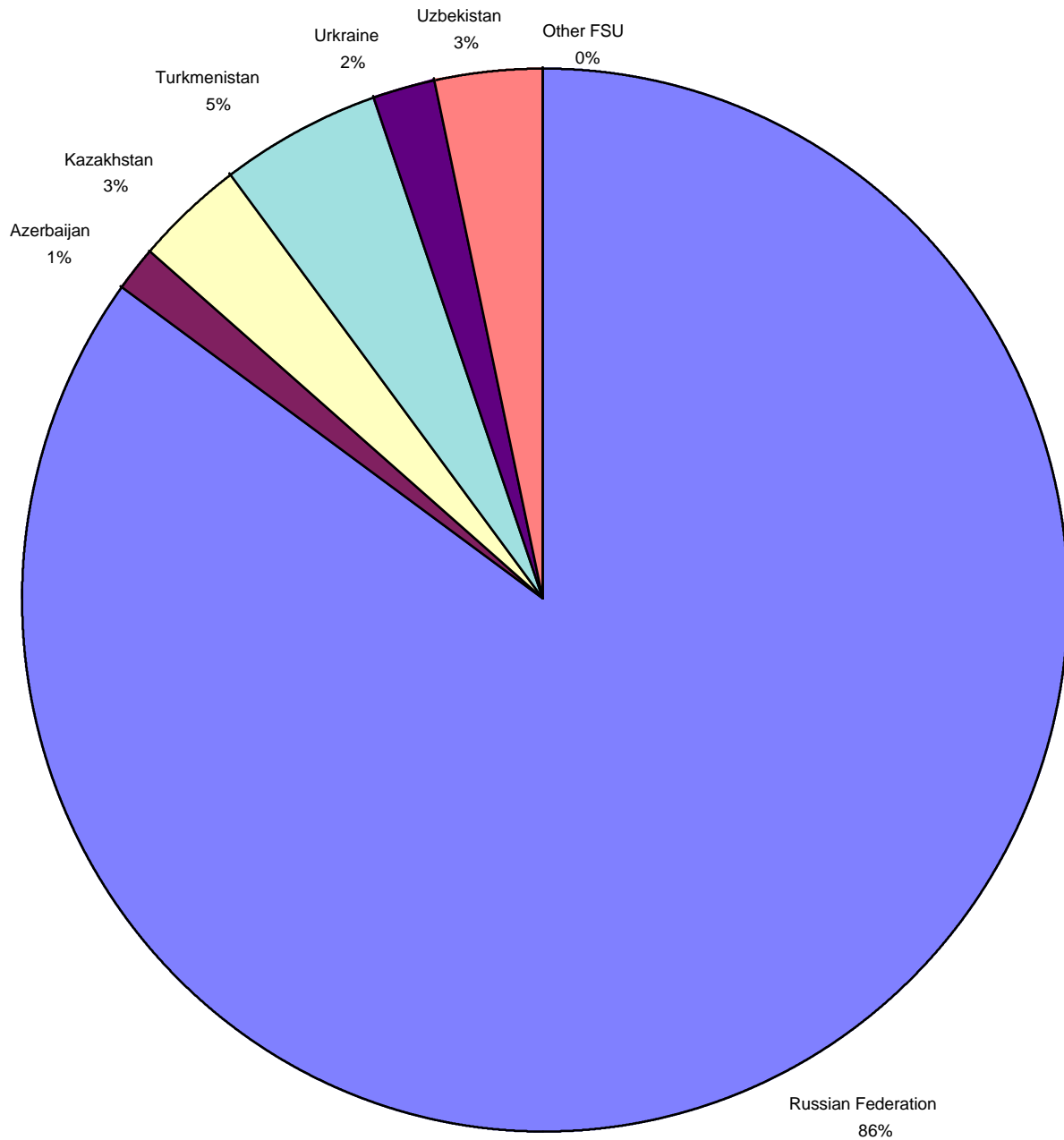
Source: Adapted by Anthony H. Cordesman from IEA, World Energy Outlook, 1996, pp. 153-158.

BP Estimate of the Gas Reserves of the FSU by Country
 (in Trillions of Cubic Feet: 1997)



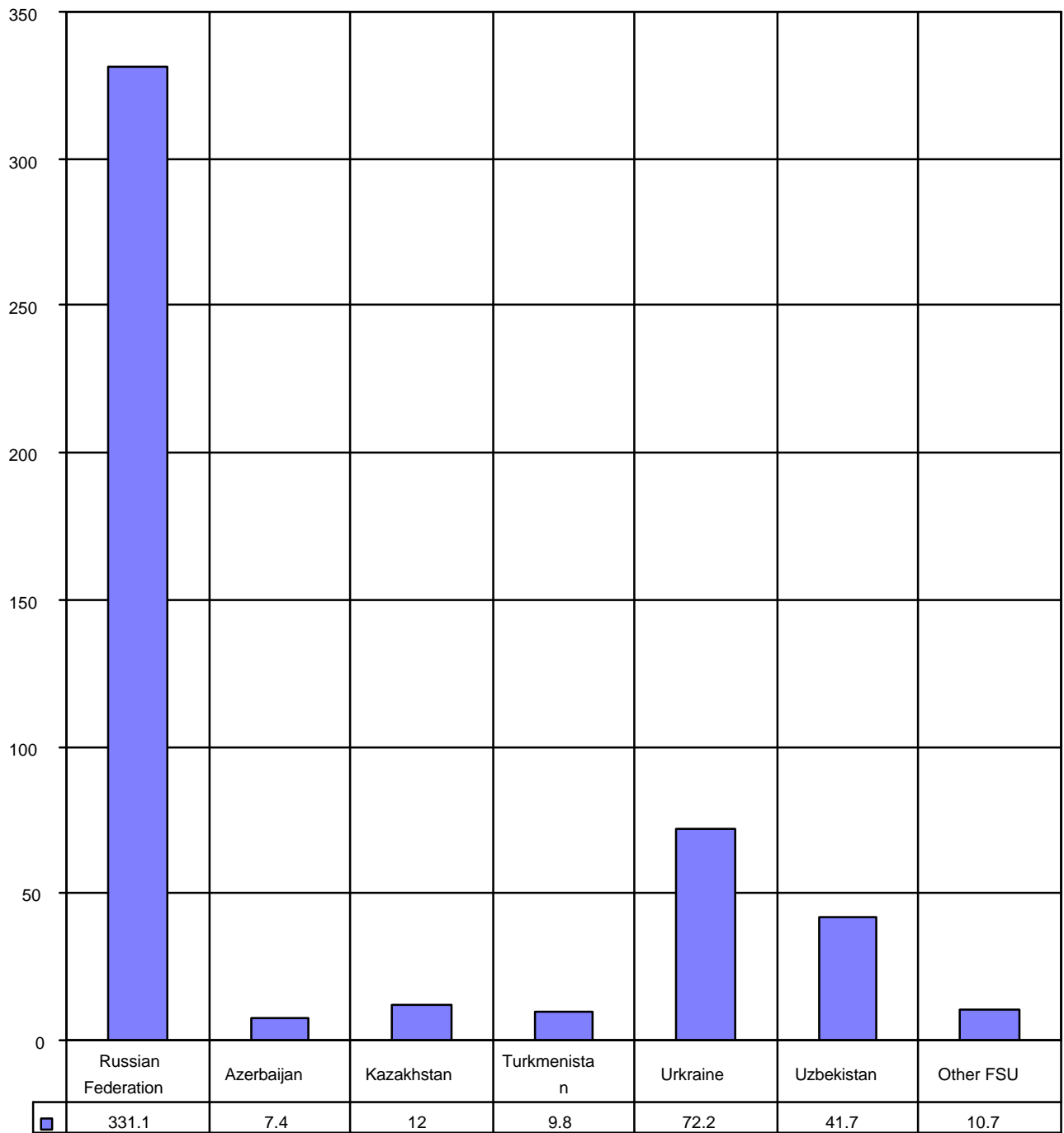
Source: Adapted by Anthony H. Cordesman from BP Statistical Review of World Energy, June, 1998, pp. 4-5.

BP Estimate of the Gas Reserves of the FSU by Country (in Trillions of Cubic Meters: 1997)



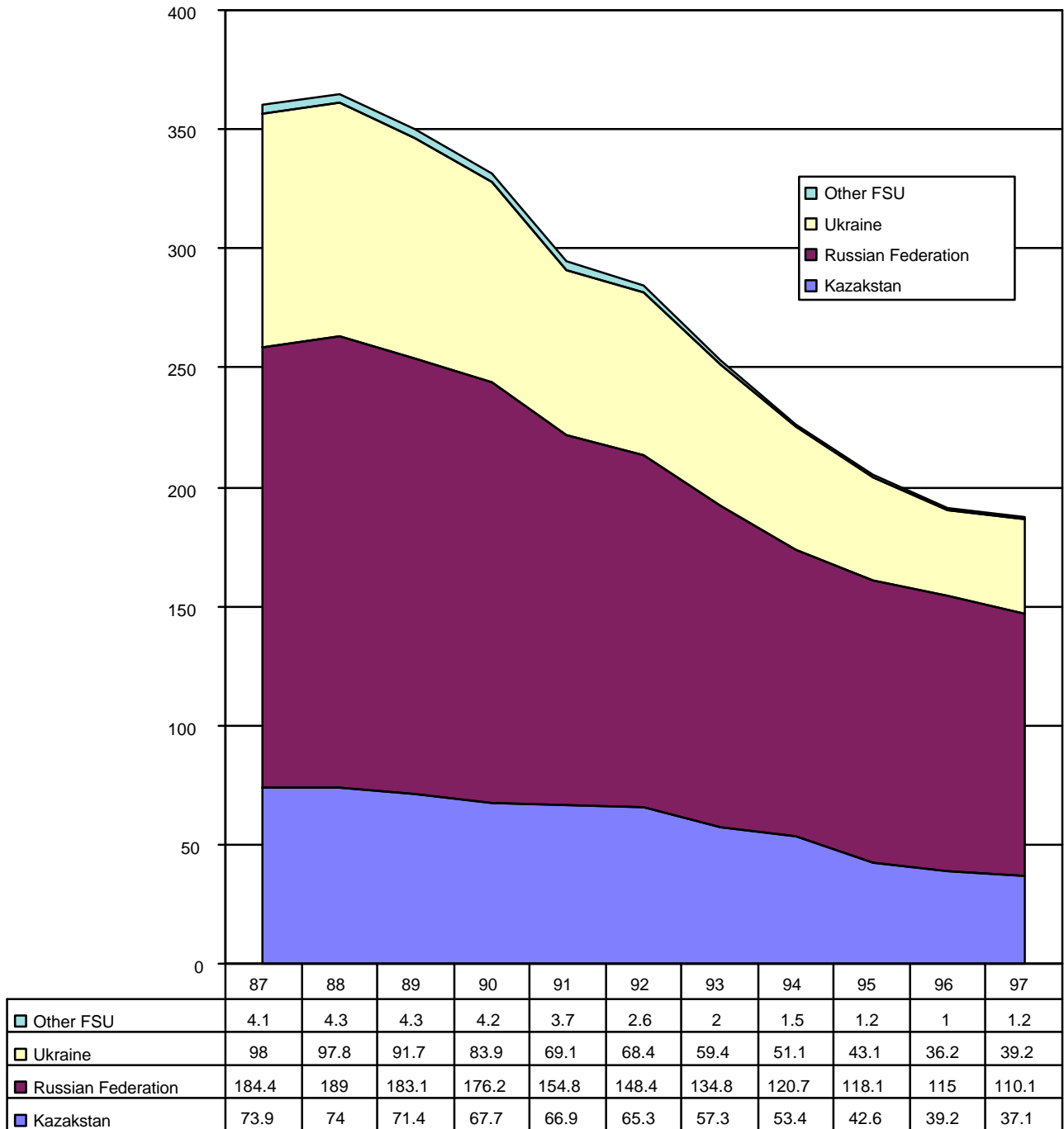
Source: Adapted by Anthony H. Cordesman from BP Statistical Review of World Energy, June, 1998, pp. 4-5.

BP Estimate of FSU Gas Production by Country (in Trillions of Cubic Meters: 1997)



Nuclear power is 4.5% of the total in the Russian federation, 3.3% in the Ukraine, and 0.6% in the rest of the FSU.
 Source: Adapted by Anthony H. Cordesman from BP Statistical Review of World Energy, June, 1998, pp. 34-35.

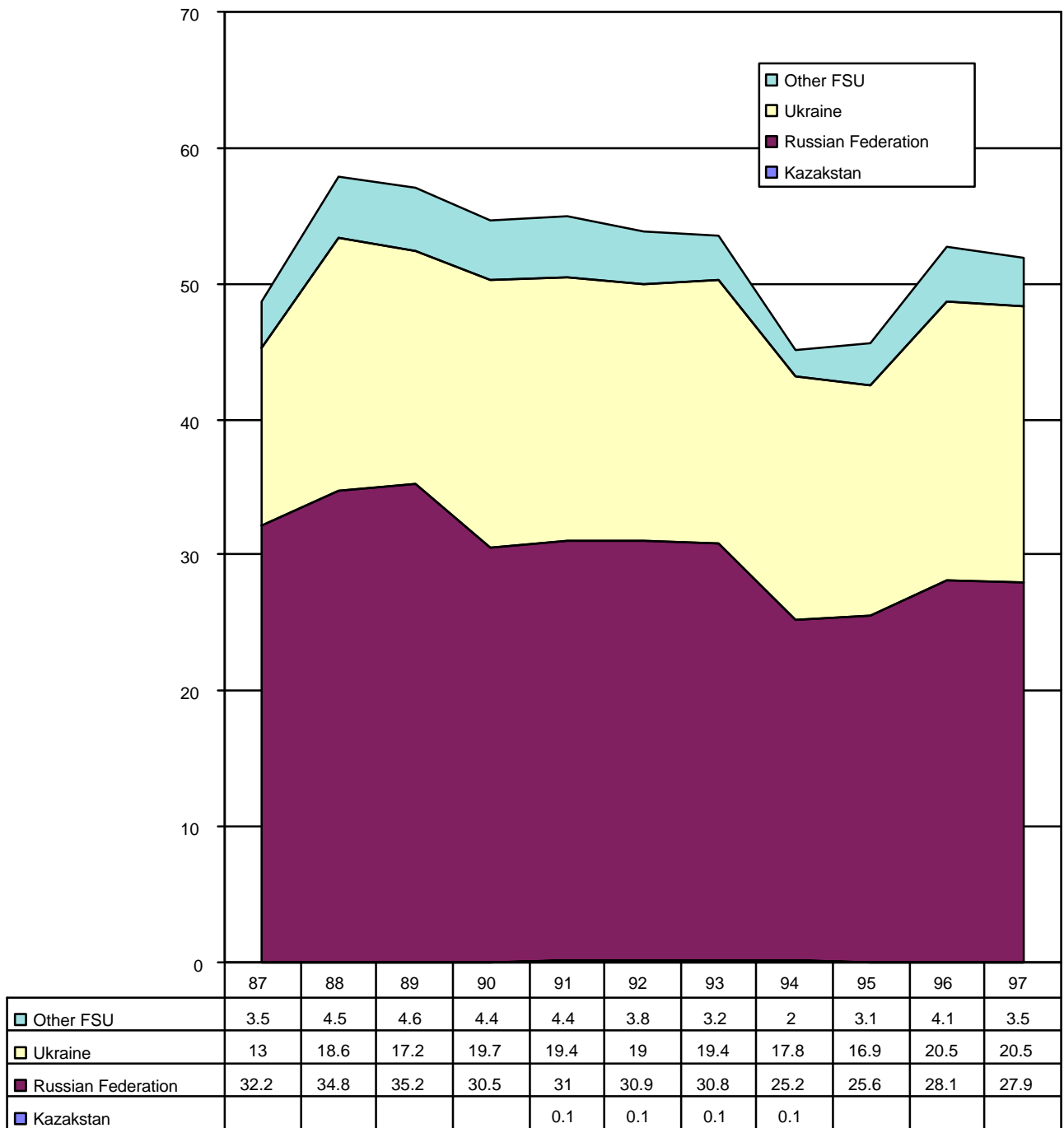
BP Estimate of Coal Production in the FSU:1987-1997
(in MTOE)



Note: The FSU has 104,000 million tones of anthracite and bituminous coal reserves and 137,000 million tons of Sub-bituminous Coal Reserves for a Total of 241,000. This is 23.4% of all world coal reserves.

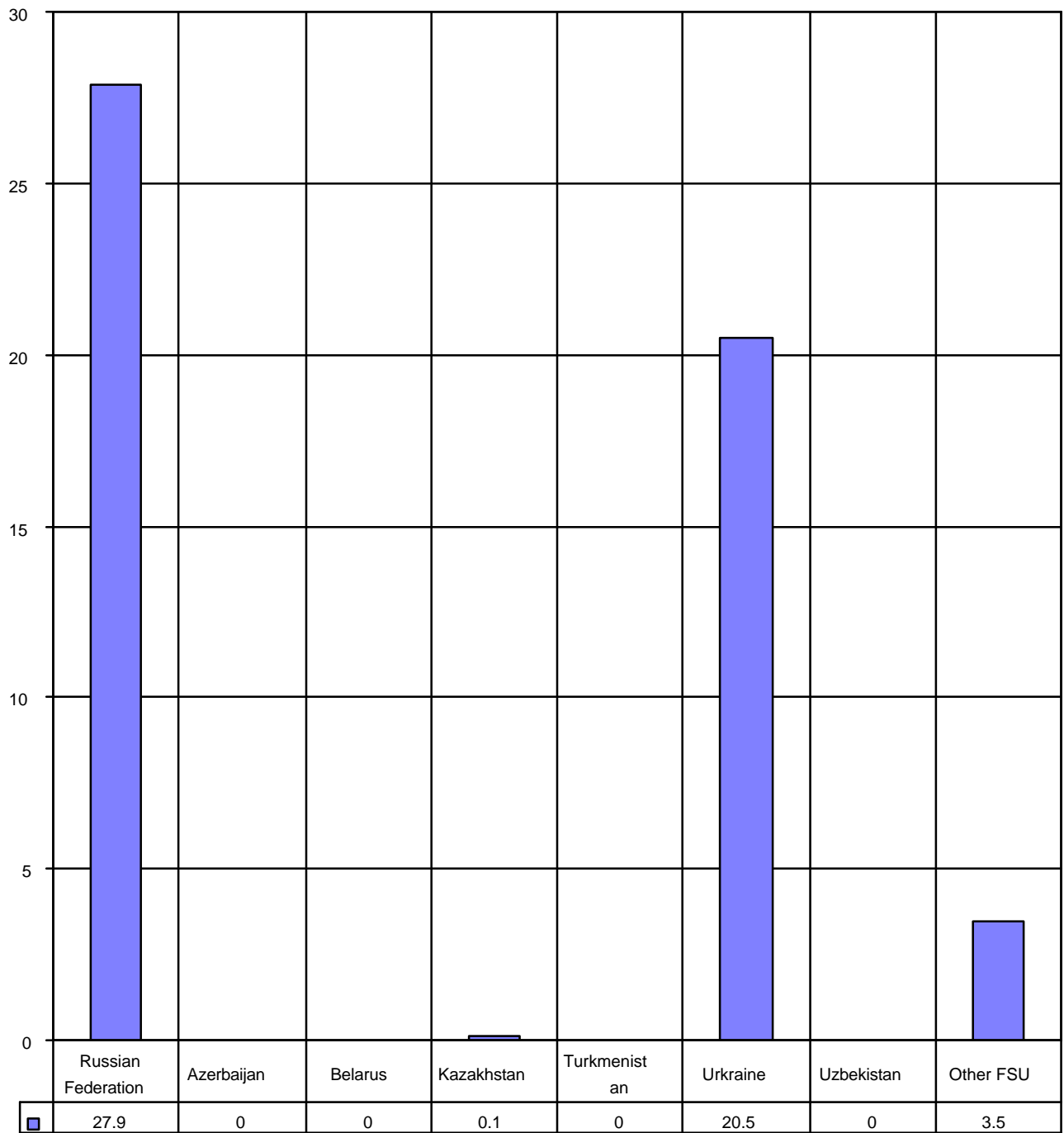
Source: Adapted by Anthony H. Cordesman from BP Statistical Review of World Energy, June, 1998, pp. 32-35.

BP Estimate of Nuclear Power Production in the FSU:1987-1997 (in MTOE)



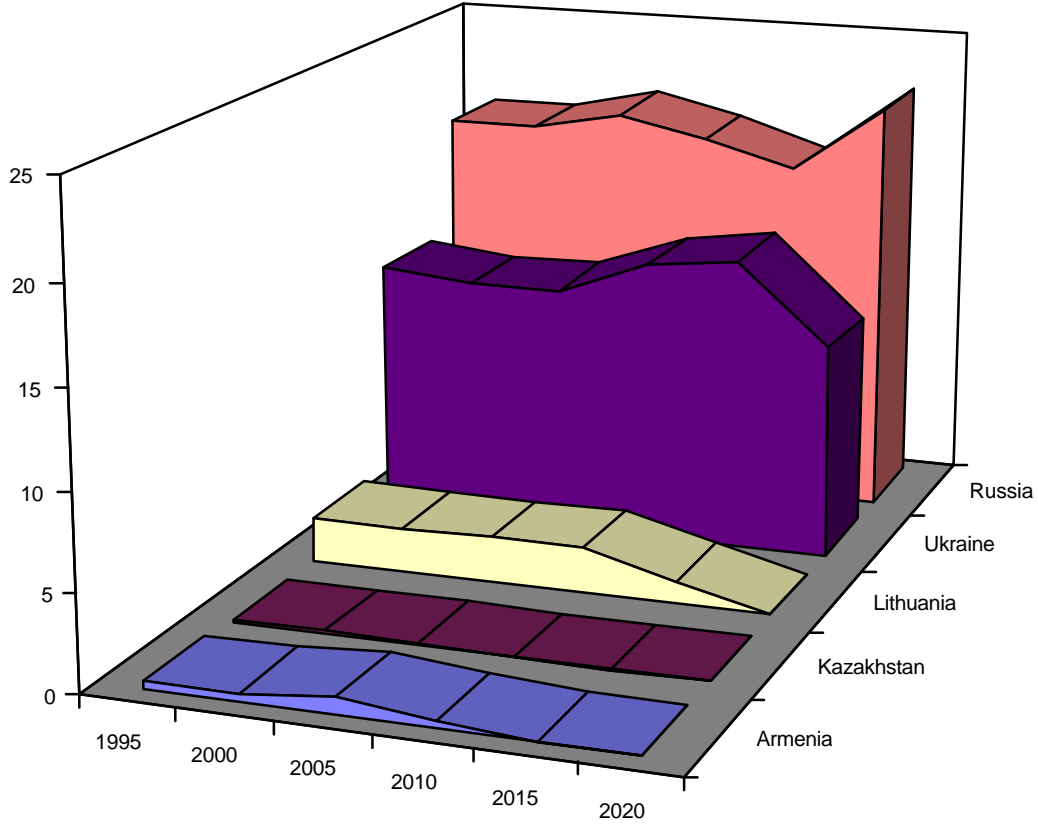
Source: Adapted by Anthony H. Cordesman from BP Statistical Review of World Energy, June, 1998, pp. 34.

BP Estimate of FSU Nuclear Power Production by Country in 1997
(in MTOE: 1997)



Source: Adapted by Anthony H. Cordesman from BP Statistical Review of World Energy, June, 1998, pp. 34.

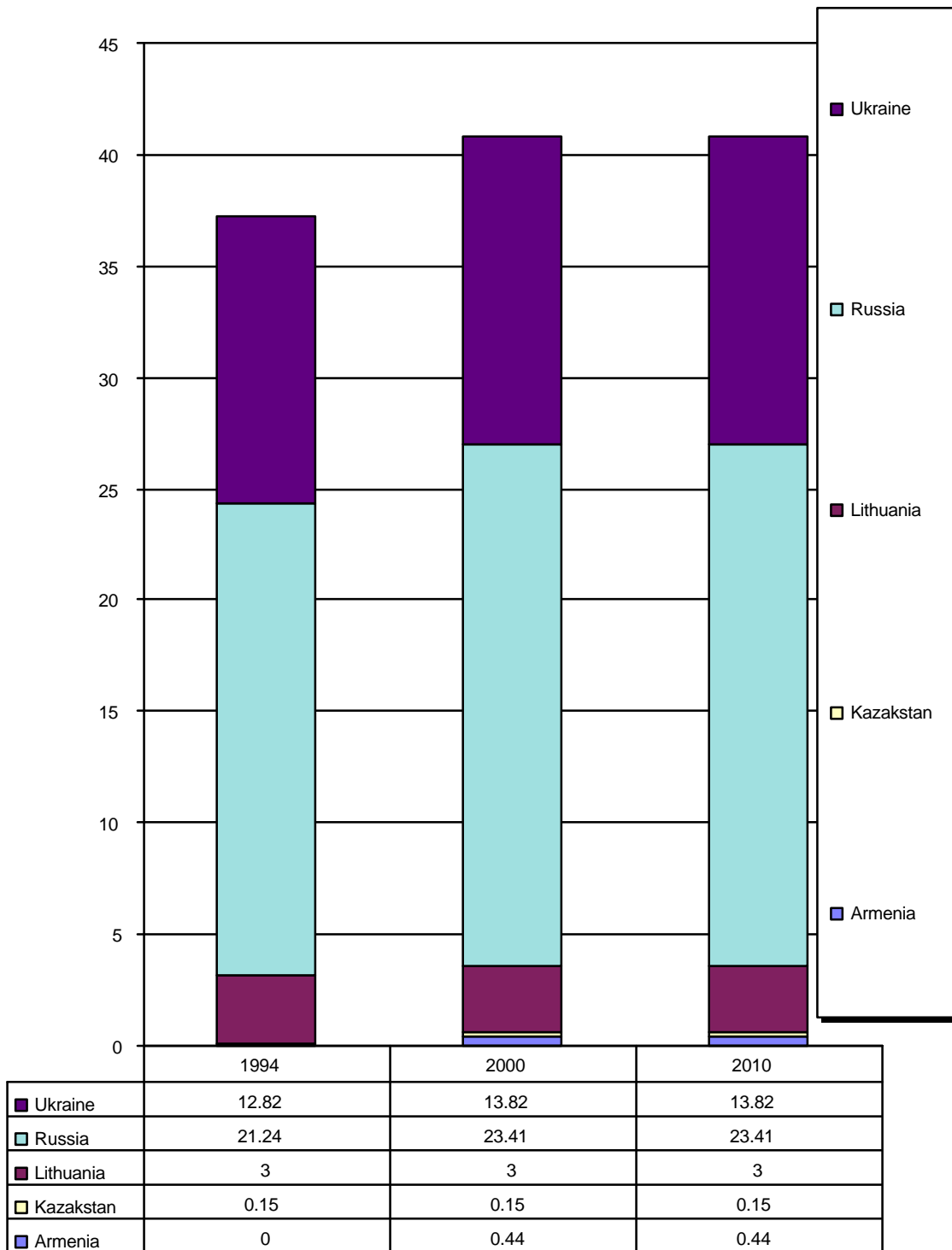
Estimated Trends in FSU Nuclear Capacity (Net Gigawatts, EIA Reference Case)



	1995	2000	2005	2010	2015	2020
■ Armenia	0.4	0.4	0.8	0.4	0	-
■ Kazakhstan	0.1	0.1	0.1	0	0	-
■ Lithuania	2.4	2.4	2.4	2.4	1.2	-
■ Ukraine	13.6	13.1	13.1	15	15.6	11.4
■ Russia	19.8	19.8	20.8	19.8	18.4	22

Source: Adapted by Anthony H. Cordesman from EIA, International Energy Outlook, 1998, DOE/EIA-0484 (97), April 1998, p. 89.

The FSU Nuclear Problem (IEA Estimate in Gigawatts)



Source: Adapted by Anthony H. Cordesman from IEA, World Energy Outlook, 1996, pp. 153-155.

Key Issues Affecting Russia

- **Internal Stability and Economic Growth**
- **Steady development and production of oil and gas reserves**
- **New Pipelines and Export Routes: China, Asia?**
- **Production versus Domestic Demand: The Future Export Surplus.**
- **Unsafe Nuclear Power.**
- **Major Environmental Problems.**

The Uncertain Future of Oil Production in Russia

- Historically, 70% of production came from Azerbaijan and Caspian region. During the 1930s to 1950s, however, production shifted to Volga-Urals region and then to super-giant West Siberian fields in the 1970s. West Siberia now provides 66% of production and Volga-Urals provides 33%.
- Proven oil reserves of at least 50 billion barrels and probably more.
- Oil production in 1995 averaged 6.1 MMBD, of which 5.8 MMBD were crude. Domestic consumption averaged 3.7 MMBD.
- Net Oil exports averaged 3.1 MMBD in 1995:
 - Shifting away from exports to FSU which dropped from 0.8 MMBD to 0.7 MMBD in 1995 -- largely because of massive financial arrears.
 - Exports to Non-FSU countries rose from 51% in 1991 to 73% in 1993, and 76% in 1994. Reached 2.4 MMBD in 1995 and are expected to stay at that level through 1997.
 - About 50% of exports to W. Europe go through Black Sea port of Novorossiysk (580,000 BPD). Other ports include Odessa. Vulnerability to poor weather is leading to plans for new ports near St. Petersburg.
 - 1.2 MMBD friendship pipeline through Ukraine operating at 60% of capacity; Russia's average throughput through its 31,000 mile pipeline net work is about 60% of its 13.5 MMBD capacity.
- 28 refineries with name plate capacity of 6.7 MMBD
- West Siberia and Sakhalin are key development areas.
- Production peaked at 12.4 MMBD in 1988, dropped to 6.1 MMBD in 1995, but seems to be leveling off.
- Production declined by 5% in 1995, versus 15% in 1994, and is expected to be constant in 1996-1997.
- Production is expected to slowly rise after 1997.
- Problems include overproduction, water flooding of fields and lack of maintenance and investment. Upstream investment fell almost 30% to \$2.5 billion in 1994, and exploratory drilling and development fell by 40%. Almost 45,000 wells, about 25% of total, were idle. 5-7% of total production is lost through accidental leakage.
- Future output heavily dependent on private and foreign investment. Legal, tax, and other barriers currently stall many key pipeline and development activities.

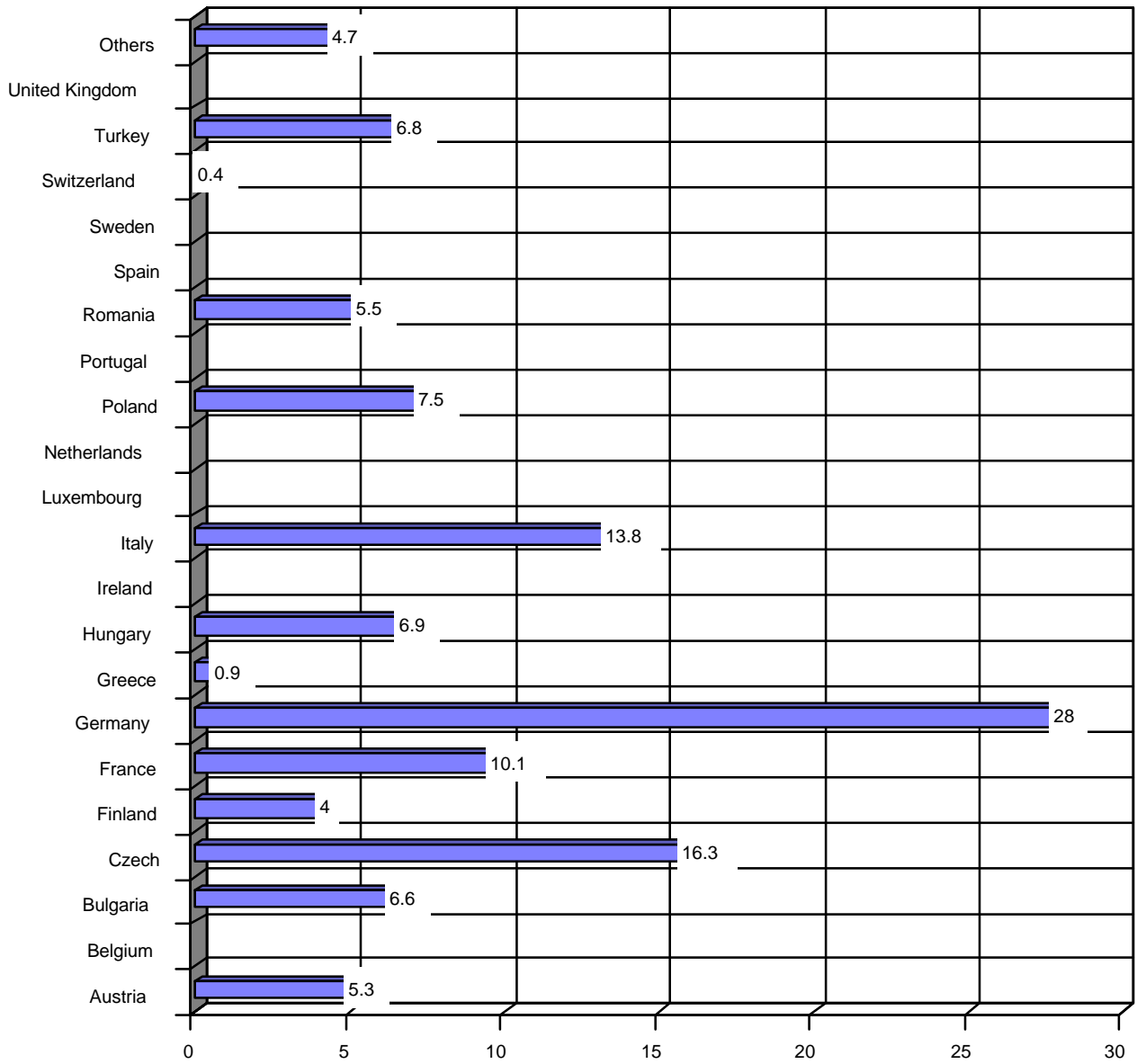
Source: Adapted by Anthony H. Cordesman from DOE/EIA on-line data base as of 12/96

The Uncertain Future of Gas Production in Russia

- Russia has 1,748 TCF of proved gas reserves, the worlds largest reserves. It has 7,500 TCF of potential reserves.
 - 7% of reserves located in 20 super giant fields in West Siberia. Each holds over 35 TCF of gas.
 - All major fields except Yamburg are in decline; Russia must develop new fields in Yamal peninsula in Far East to maintain production and expand existing production in Tyumen region of Western Siberia.
- Gas output has dropped from peak of 22.6 TCF in 1991 to around 21.1 TCF in 1995.
 - Continuous permafrost, environmental concerns, delays in pipeline expansion and under-investment are potential risks.
 - Over half of Gazprom's pipeline net work is over 30 years old and exceeds original design life.
 - Gazprom is owed \$6.8 billion for gas shipments to domestic and other FSU customers, particularly the Ukraine.
 - It needs \$3 billion more in foreign investment to meet short-term pipeline repairs and more for new pipelines and oil field development.
- Production is expected to level off during 1996-1997 and then rise to 22.9 TCF by 2000.

Source: Adapted by Anthony H. Cordesman from DOE/EIA on-line data base as of 12/96.

BP Estimate of Russian Federation Gas Exports by Country of Destination (in Billions of Cubic Meters: 1997)

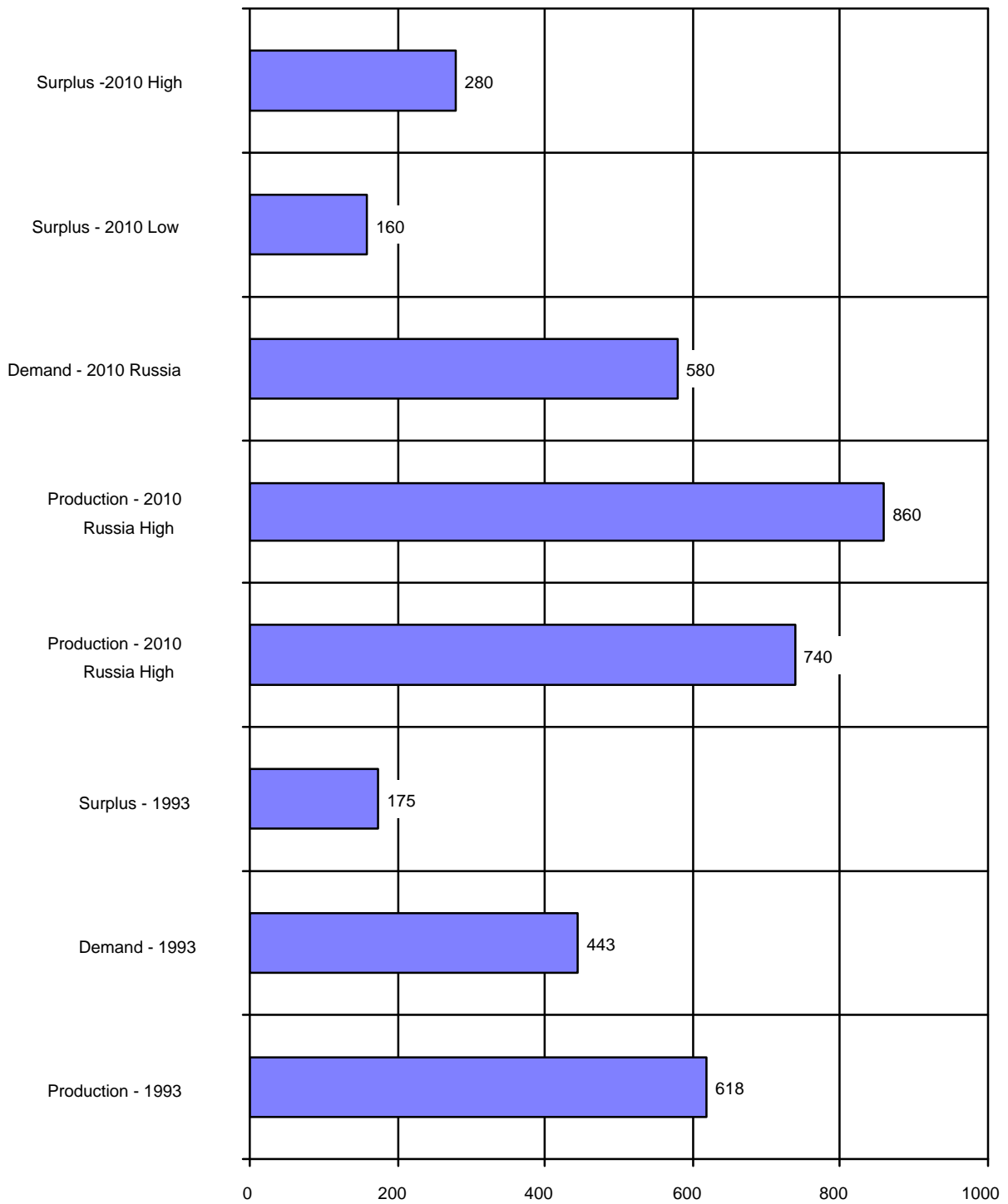


Total gas exports = 116.8 BCF. Russia is not a significant export of LNG.

Source: Adapted by Anthony H. Cordesman from BP Statistical Review of World Energy, June, 1998, pp. 28-29.

Russian Estimate of Possible Gas Production versus Surplus Export Capacity in Russia in 2010

(Russian Estimate in BCM)



Source: Adapted by Anthony H. Cordesman from IEA, *World Energy Outlook, 1996*, pp. 158-160. IEA assumes Russian domestic demand of 477-689 BCM.

Key Issues Affecting the Caspian, Central Asia, and Other FSU Countries

- **Internal Stability and Economic Growth**
- **Steady development and production of oil and gas reserves**
- **New Pipelines and Export Routes: Iran, Afghanistan, Europe, Turkey, China, Asia?**
- **Production versus Domestic Demand: The Future Export Surplus.**
- **Unsafe Nuclear Power.**
- **Major Environmental Problems.**

The Uncertain Future of Oil Production in Other FSU Countries - Part One

Armenia:

- Seeking oil and gas, but limited production to date.
- Key issue is future as transit center.

Azerbaijan

- Most oil is now offshore in Caspian, There are 17 fields, and the Guneshli field, 60 miles off the coast, accounts for 50% of production. All crude is refined at two refineries in Baku, and only product is exported. Iran is biggest customer (fuel oil).
- Oil production peaked at 0.5 MMBD in WWII, and dropped to 0.222 MMBD in 1992 and 0.176 MMBD in 1995. Shortages of funds for drill pipe and other imports have sharply reduced development and exploratory activity since 1994 and problems will continue through 1997.
- However, a major international consortium (\$8 billion) is investing in the expansion of Caspian fields with reserves of 3-5 billion barrels. Some new production could begin in 1997.
- Goal is production peak of 0.7 MMBD by 2010. Will build new pipelines for crude exports.
- Problems exist over pipeline routes and rights, legal status of Caspian.
- Almost all gas is associated. Seeking to develop new gas fields in Caspian to end need for imports. Three fields with an estimated 2.5 TCF are under development with initial production goal of meeting all domestic demand by 2005.

Kazakhstan

- Some local estimates indicate that Kazakhstan has 6-9 billion barrels in its Tengiz oil field and 65-80 billion barrels of reserves in its area of the Caspian sea. EIA estimates Tengiz has 3-10 billion barrels, and does not estimate offshore holdings.
- Second-largest FSU producer after Russia. Producing an average of about 0.48 MMBD during 1994-1997.
 - Production is now exported to Russia as part of a swap arrangement
 - Chevron has \$20 billion 50/50 joint venture to develop Tengiz field, which currently produces only 100,000 BPD. This venture has delays because of a lack of an export outlet, and the presence of mercaptans (corrosive chemicals) in the oil.
 - Mobil also has ventures affecting Tengiz.
 - Other projects will expand refinery capacity, explore Tulpar bloc in northwest, and explore off-shore resources in Caspian.
 - Seems to be agreement on Caspian Pipeline Consortium to fund \$1.2 billion 900-mile pipeline to new oil terminal on Taman peninsula on Black Sea.

The Uncertain Future of Oil Production in Other FSU Countries - Part Two

Kazakstan - Continued

- Has about 83 TCF of natural gas, of which 62 TCF is associated with oil. Giant Karachaganak field alone has 46 TCF. Tengiz is estimated to have 13 TCF.
 - Now produces only about 200-250 BCF of gas -- 1% of FSU output.
 - Major projects to expand export and domestic capacity in Karachaganak and Tengiz
 - However, lack infrastructure, pipelines. Now imports gas to meet 90% of domestic demand, while exports gas to Russia. Owes Uzbekistan \$50 million for gas imports.

Kyrgyzstan

- Has seven developed oil fields and two oil/gas fields but proven reserves are not well established, and recovery rates are low due to difficult geological structures and water encroachment.
- Major gas importers from Uzbekistan. Currently unable to pay import bill for imports of 35 BCF per year.

Tajikistan

- Produces only 2,000 barrels of oil a day. Reliant on imports from Russia.
- Has gas reserves of 1 TCF, but production is minimal. Imports from Uzbekistan and Turkmenistan, and has poor record of payments.

Turkmenistan

- Has 1.4 billion barrels of oil reserves and current production rate of 93,000 BPD.
 - Goal is to raise production to 0.56 MMBD by 2000, but joint ventures to reach this goal are experiencing major legal problems.
 - These ventures have goals of 50,000 BPD and 85,000 BPD -- much less than the capacity Turkmenistan is seeking.
- Two major refineries with 116,000 BPD and 120,000 BPD capacity. Both slated for expansion.
- Second-largest gas producer in FSU, and ranks third in world after Russia and Iran.
 - Has proven gas reserves of 100 TCF, and may have total of up to 535 TCF.
 - Largest fields are in Amu-Dar'ya basin, with half of reserves in giant Dauletabad-Donmez field. Also has large reserves in Murgab basin, with one field of 27 TCF.
 - Now dependent on pipelines through Russia. Plans 90 mile hook-up to Iran's pipeline grid for gas swap. Is seeking routes through Afghanistan, China, and to Caspian.
 - Major exporter to Ukraine, Georgia, Kazakstan, Uzbekistan, and Azerbaijan. All have lagged in payment.

The Uncertain Future of Oil Production in Other FSU Countries - Part Three

Uzbekistan

Has 300 million barrels of proved oil reserves, but is currently a net importer of crude.

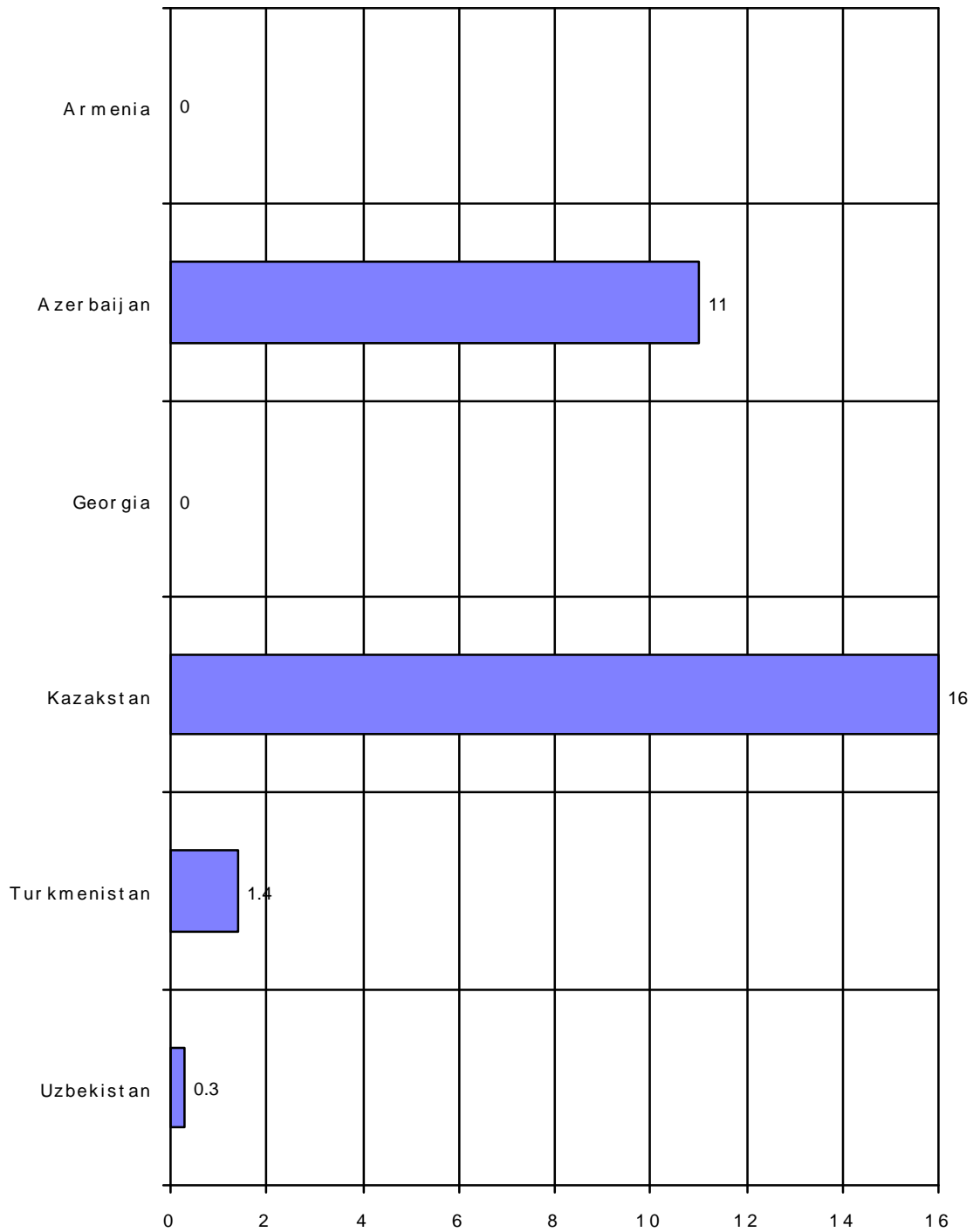
Discovered new Mingbulok field in 1992, and oil output is rising sharply -- 30% in 1993 alone.

Hopes to double oil production between 1995 and 2000.

Two major refineries with 108,000 and 66,000 BPD capacity.

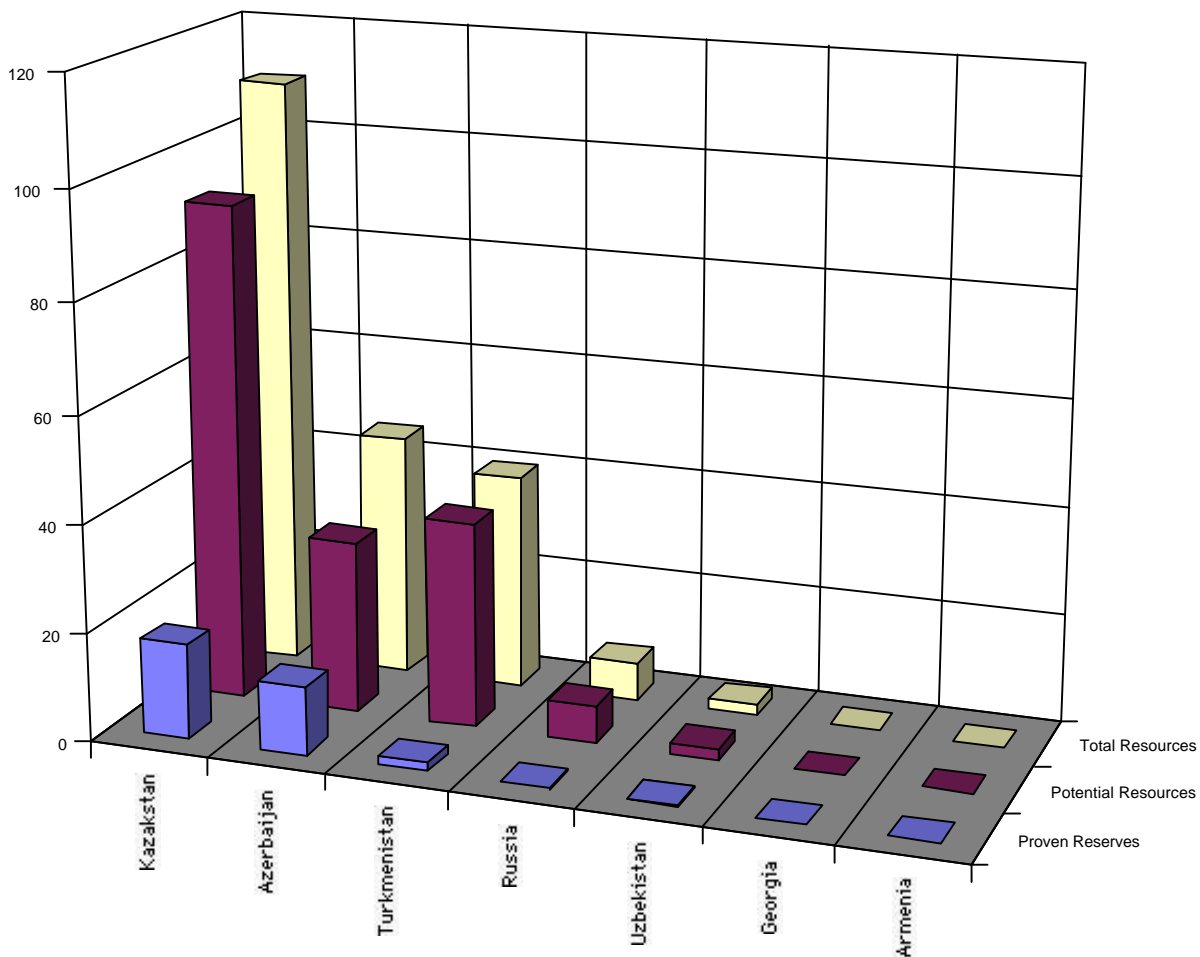
Largest consumer of gas in Central Asia. However, expansion of production from Amu-Dayra and North Ustyurt basin have allowed to become a net exporter of gas.

The Uncertainty Factor: Oil and Gas Journal Estimate of Comparative Oil Reserves in the Caspian and Asiatic Republics in Billions of Barrels



Source: Adapted by Anthony H. Cordesman from material in the Oil and Gas Journal, the API data bases, and EIA data base.

The Uncertainty Factor: International Energy Forecast Estimate of Comparative Oil Reserves in the Caspian and Asiatic Republics (in Billions of Barrels)



	Kazakstan	Azerbaijan	Turkmenistan	Russia	Uzbekistan	Georgia	Armenia
■ Proven Reserves	17.6	12.5	1.7	0.3	0.3	0	0
■ Potential Resources	92	32	38	7	2	0	0
■ Total Resources	110	45	40	7	2	0	0

Source: Adapted by Anthony H. Cordesman from DOE/EIA, International Energy Outlook, 1998, p. 34.