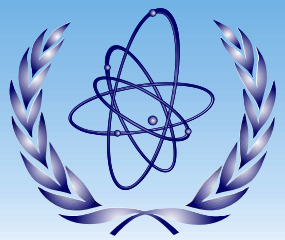


International Atomic Energy Agency

NUCLEAR POWER OVERVIEW

Jiri Mandula,
IAEA, Division of Nuclear Power

Nuclear Power

- Nuclear energy since 1954
- Fast development from 1960s to 1980s
- An important part of a global energy mix – 12.3%
- >15 100 reactor-years of operating experience
- World energy demand is expected to more than double by 2050, and expansion of nuclear energy is a key to meeting this demand while reducing pollution and greenhouse gases
- A number of countries are expressing interest in introducing nuclear power
- In 2011, nuclear energy continued to play an important role in global electricity production despite the accident at the Fukushima Daiichi nuclear power plant.

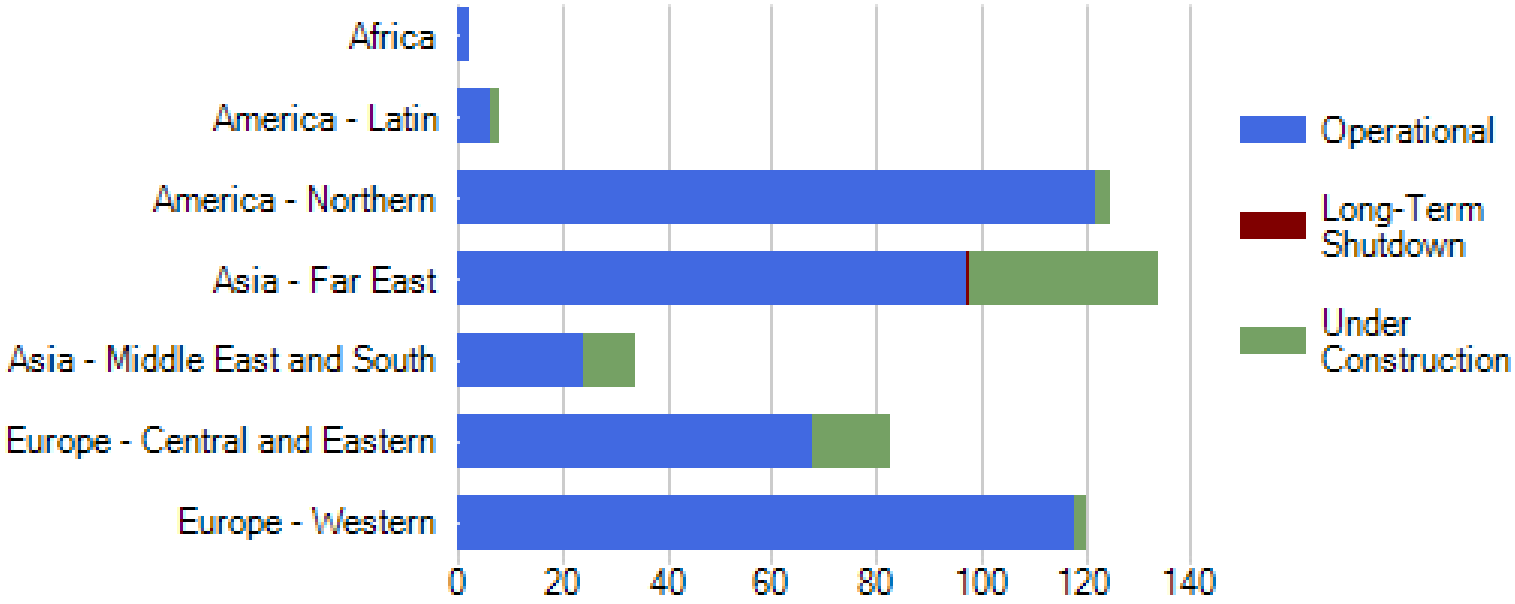
Reference: IAEA-PRIS

Nuclear Reactors in the World

Reference: IAEA-PRIS

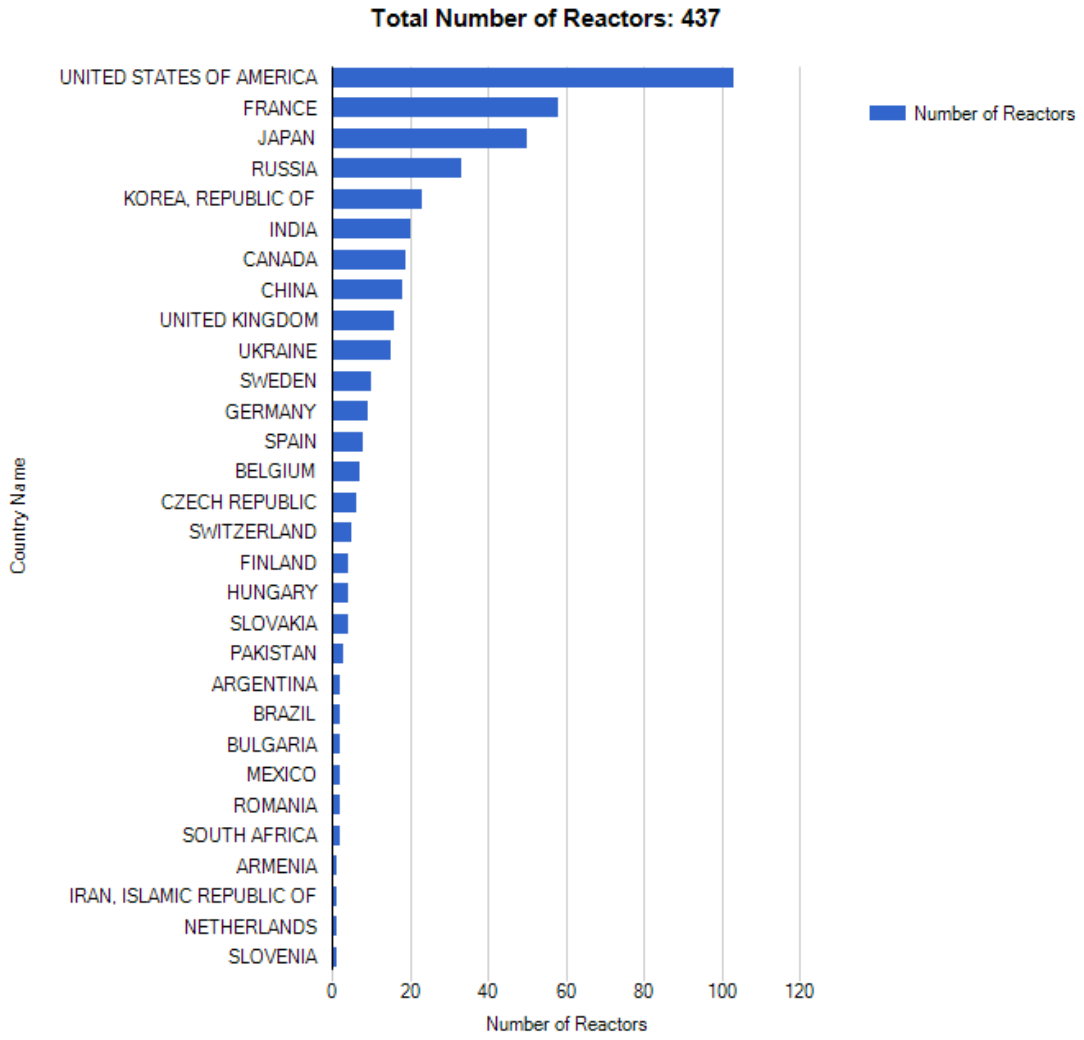
Current status

- 437 reactors in operation (373 GW_e)
- 1 reactors in long-term shutdown
- 68 reactors under construction (65 GW_e)



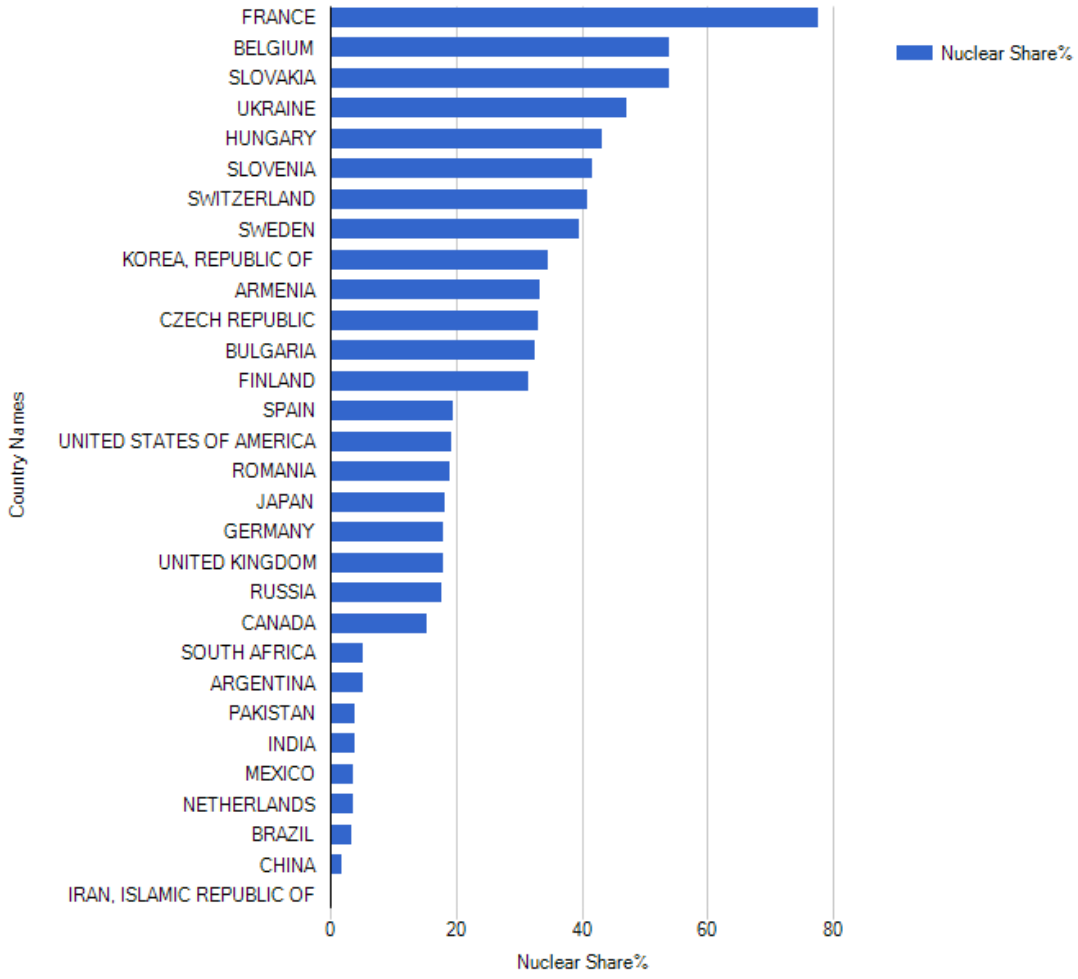
Reference: IAEA-PRIS

Nuclear reactors by country



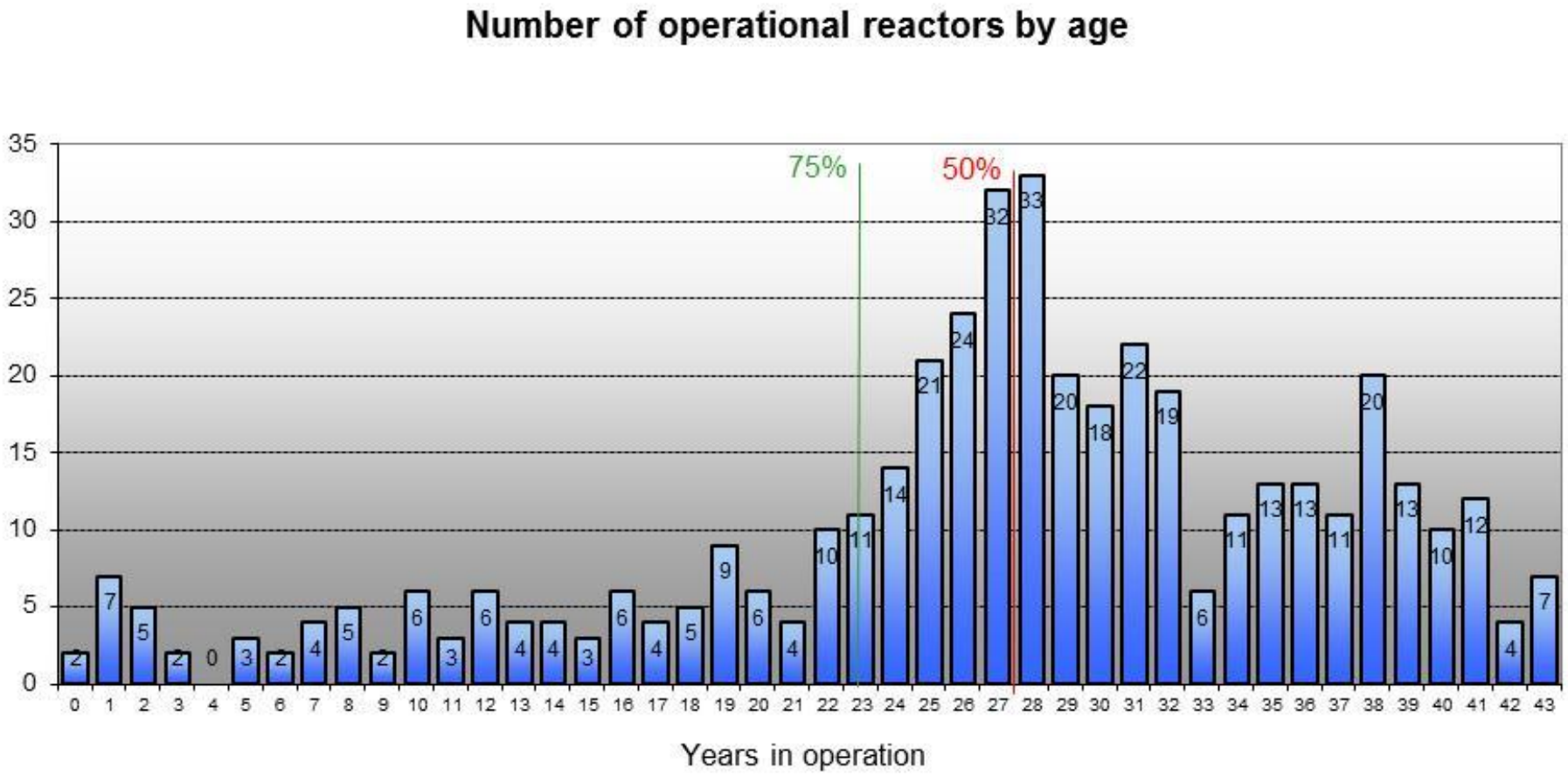
Reference: IAEA-PRIS

Nuclear share in 2011



Reference: IAEA-PRIS

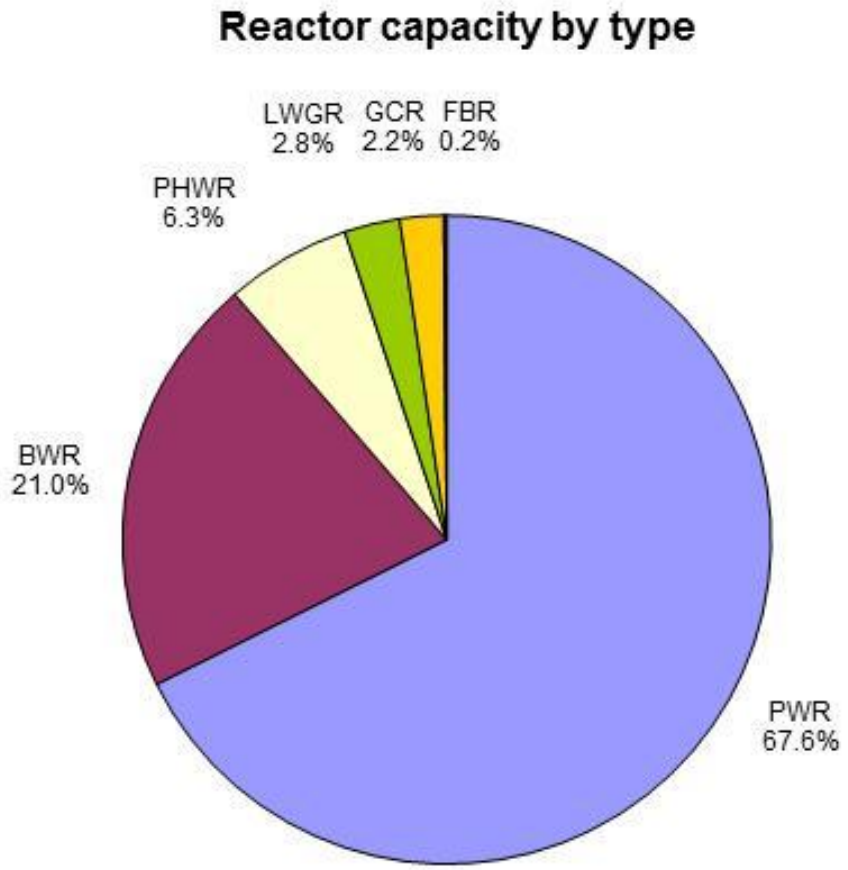
Age of operating reactors



Reference: IAEA-PRIS

Reactor types

- BWR: Boiling light water cooled and moderated reactor
- FBR: Fast breeder reactor
- GCR: Gas cooled graphite moderated reactor
- LWGR: Light water cooled graphite moderated reactor
- PHWR: Pressurized heavy water moderated and cooled reactor
- PWR: Pressurized light water moderated and cooled reactor



Reference: IAEA-PRIS

2012 status changes

3 New connections to the grid (7 in 2011)

SHIN-WOLSONG-1	(997 MW(e), PWR, KOREA REP.) on 27 January
SHIN-KORI-2	(960 MW(e), PWR, KOREA REP.) on 28 January
NINGDE 1	(1000 MW(e), PWR, CHINA) on 28 December

2 Restarts after long-term shutdown

BRUCE-1	(772 MW(e), PHWR, CANADA) on 19 September
BRUCE-2	(772 MW(e), PHWR, CANADA) on 16 October

3 Permanent shutdowns (13 in 2011)

OLDBURY-A1	(217 MW(e), GCR, UK) on 29 February
WYLFA 2	(490 MW(e), GCR, UK) on 25 April
GENTILLY-2	(635 MW(e), PHWR, CANADA) on 28 December

7 Construction starts (4 in 2011)

BALTIISK-1	(1082 MW(e), PWR, RUSSIA) on 22 February
SHIN-ULCHIN-1	(1340 MW(e), PWR, KOREA REP.) on 10 July
BARAKAH 1	(1345 MW(e), PWR, UAE) on 18 July
FUQING 4	(1000 MW(e), PWR, CHINA) on 17 November
YANGJIANG 4	(1000 MW(e), PWR, CHINA) on 17 November
SHIDAOWAN 1	(200 MW(e), HTGR, CHINA) on 9 December
TIANWAN 3	(933 MW(e), PWR, CHINA) on 27 December

2 Cancelled Constructions

BELENE-1	(953 MW(e), PWR, BULGARIA) on 28 March
BELENE-2	(953 MW(e), PWR, BULGARIA) on 28 March

Reference: IAEA-PRIS

2013 status changes

New connections to the grid

HONGYANHE 1	(1000 MW(e), PWR, CHINA) on 17 February

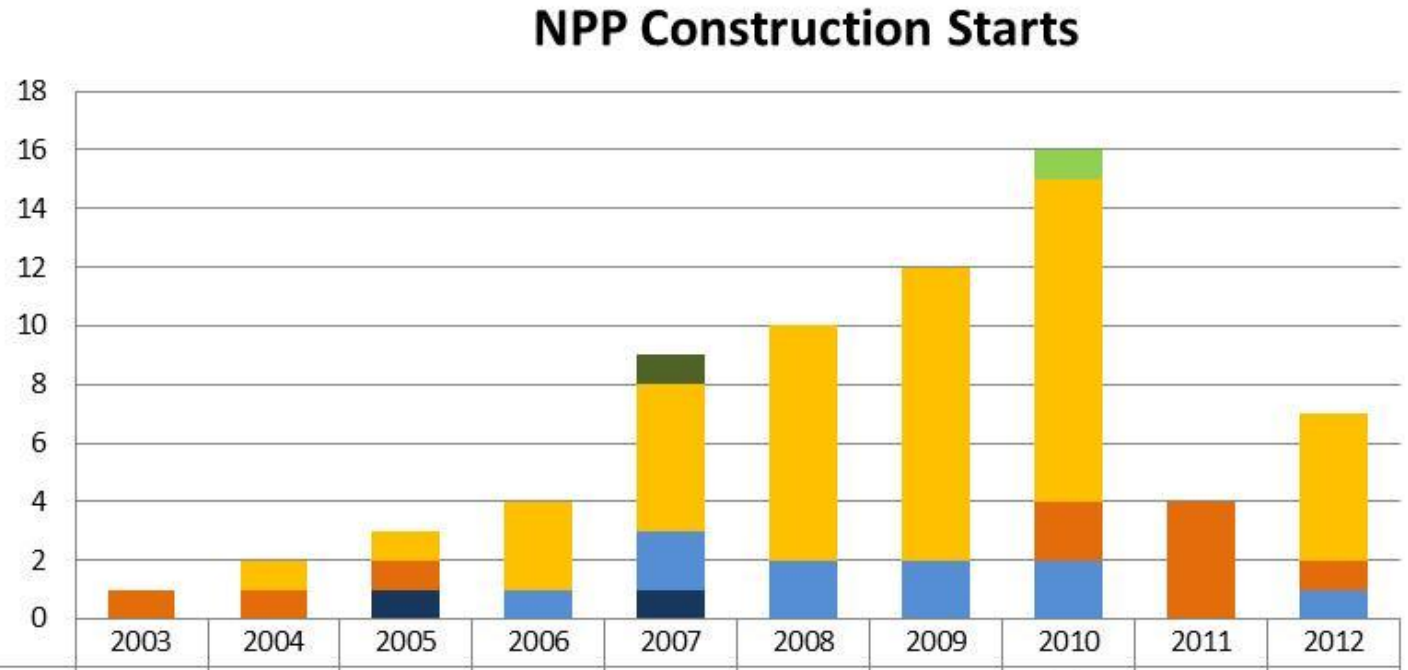
Permanent shutdowns

CRYSTAL RIVER-3	(860 MW(e), PWR, USA) on 5 February

Construction starts

VIRGIL C. SUMMER-2	(1117 MW(e), PWR, USA) on 9 March
VOGTLE-3	(1117 MW(e), PWR, USA) on 12 March

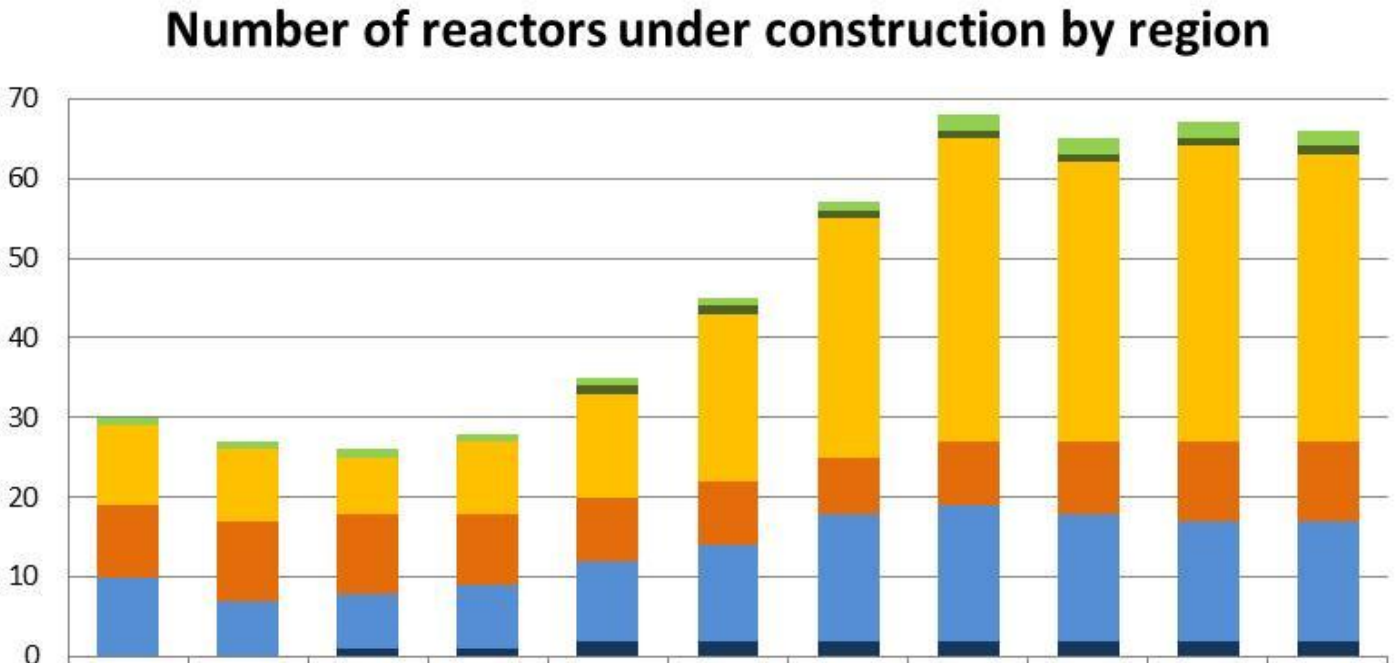
Trend in construction starts



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
America - Latin								1		
America - Northern					1					
Asia - Far East		1	1	3	5	8	10	11		5
Asia - Middle East and South	1	1	1					2	4	1
Europe - Central and Eastern				1	2	2	2	2		1
Europe - Western			1		1					

Reference: IAEA-PRIS

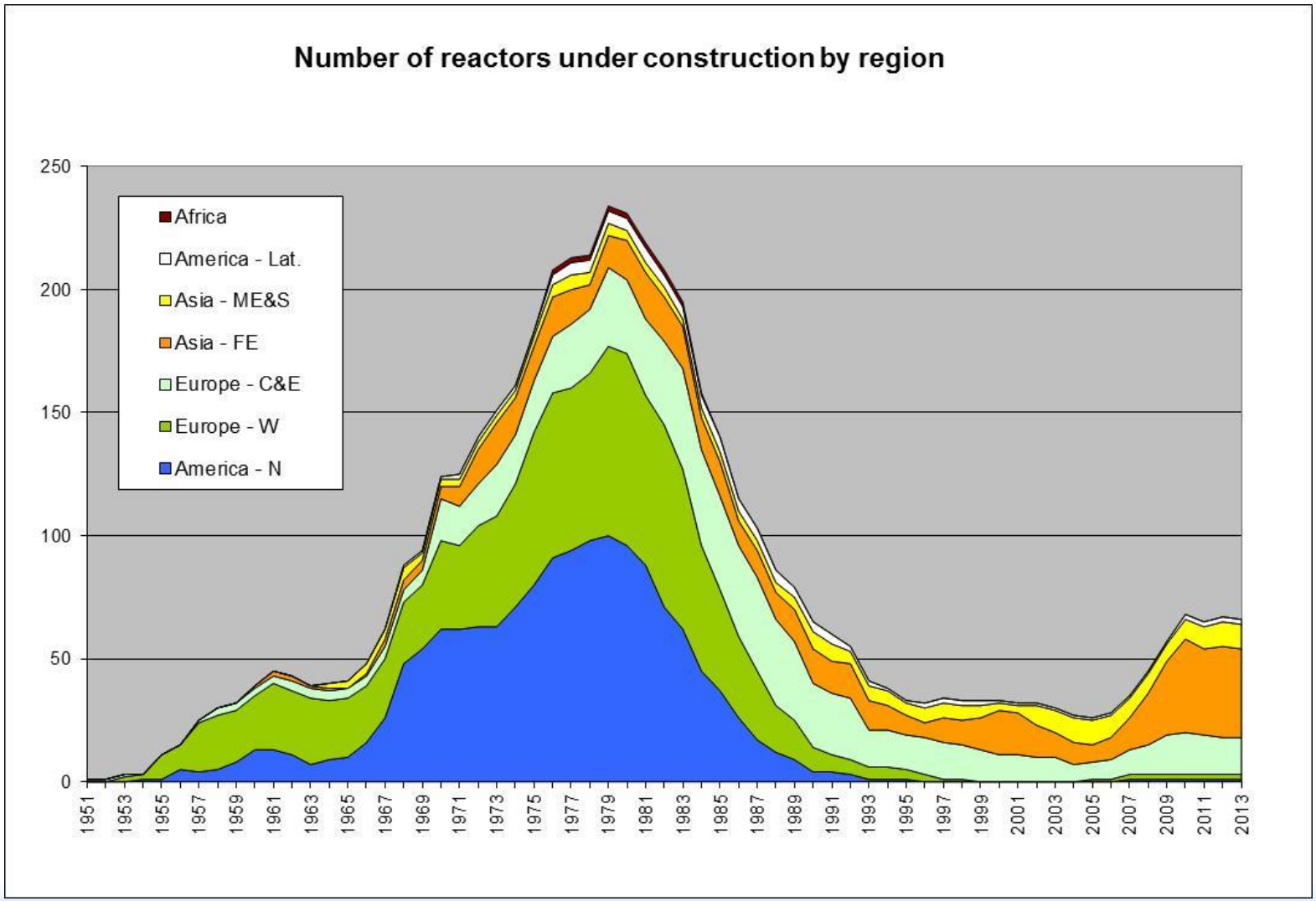
History of NPP construction



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
America - Latin	1	1	1	1	1	1	1	2	2	2	2
America - Northern	0	0	0	0	1	1	1	1	1	1	1
Asia - Far East	10	9	7	9	13	21	30	38	35	37	36
Asia - Middle East and South	9	10	10	9	8	8	7	8	9	10	10
Europe - Central and Eastern	10	7	7	8	10	12	16	17	16	15	15
Europe - Western	0	0	1	1	2	2	2	2	2	2	2

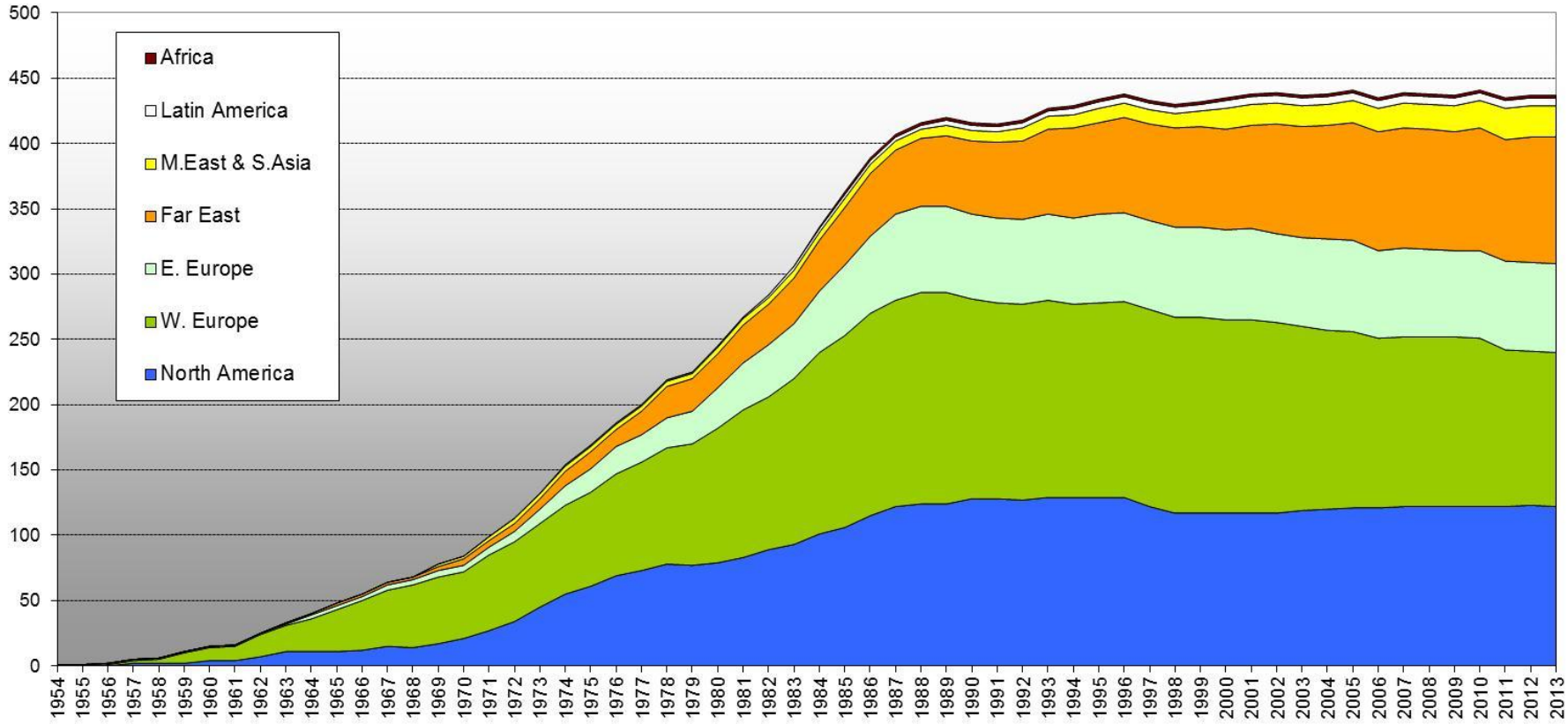
Reference: IAEA-PRIS

Full history of NPP construction



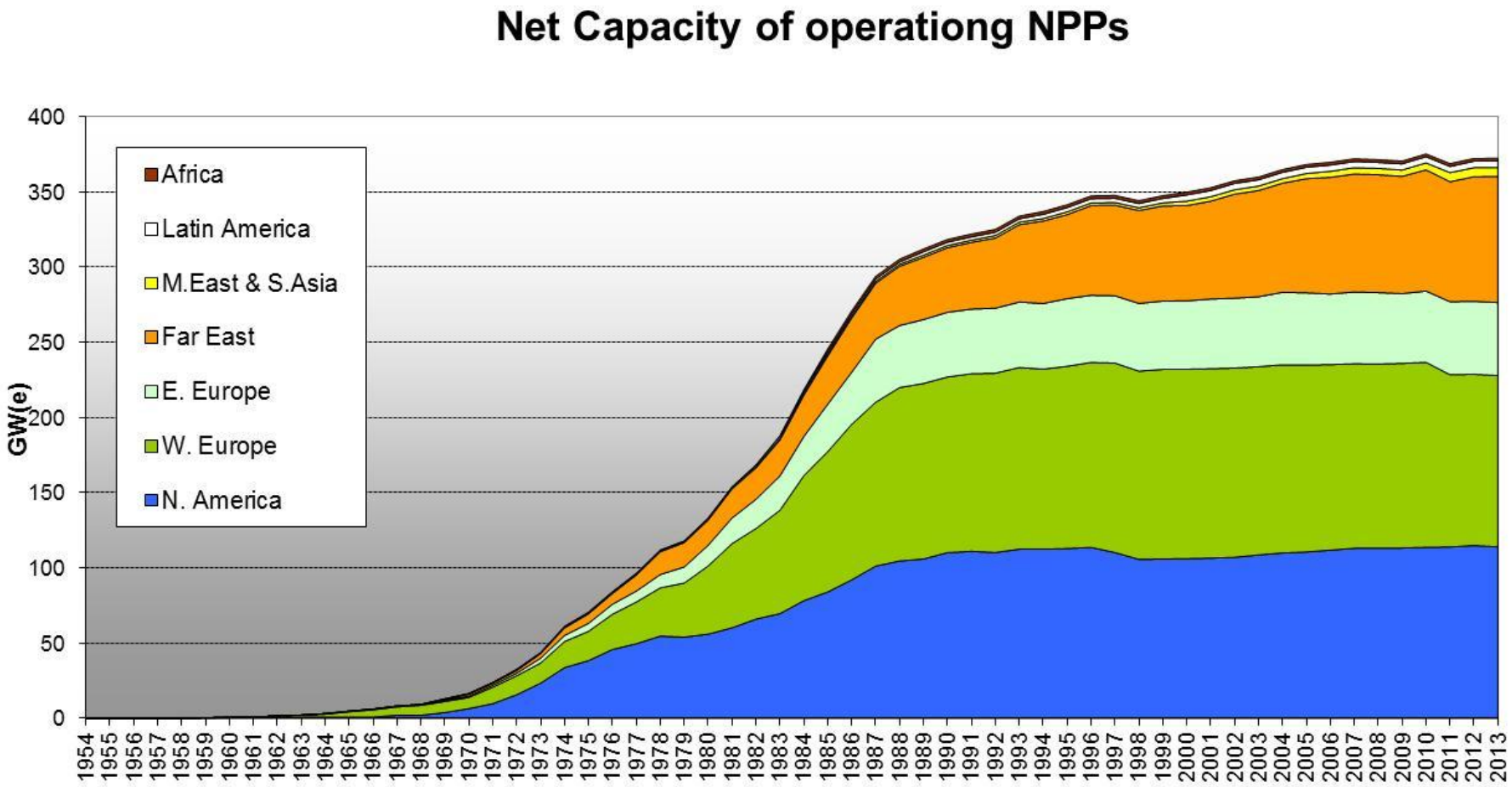
Reference: IAEA-PRIS

Operational reactors by region



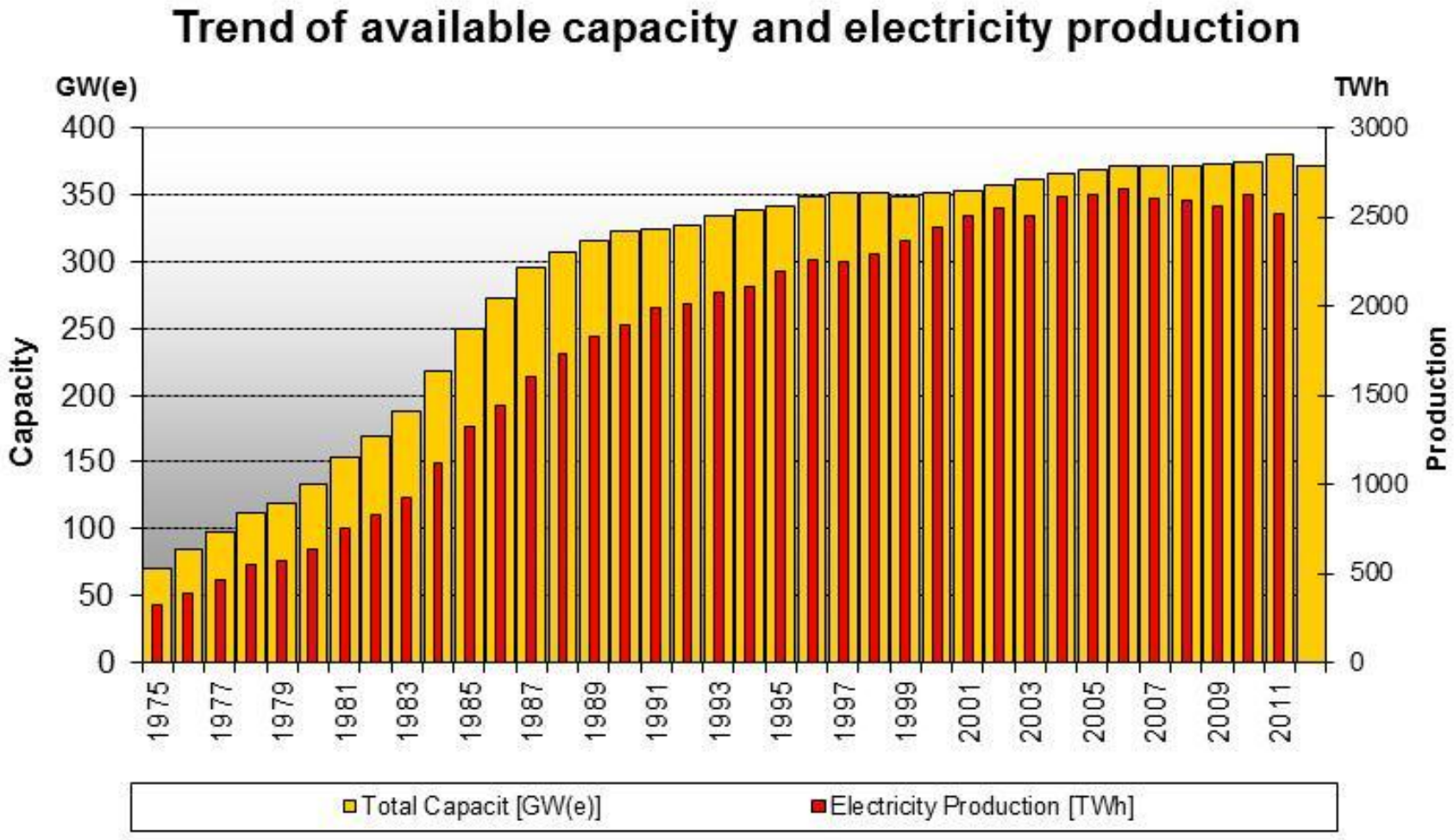
Reference: IAEA-PRIS

Net Capacity by region



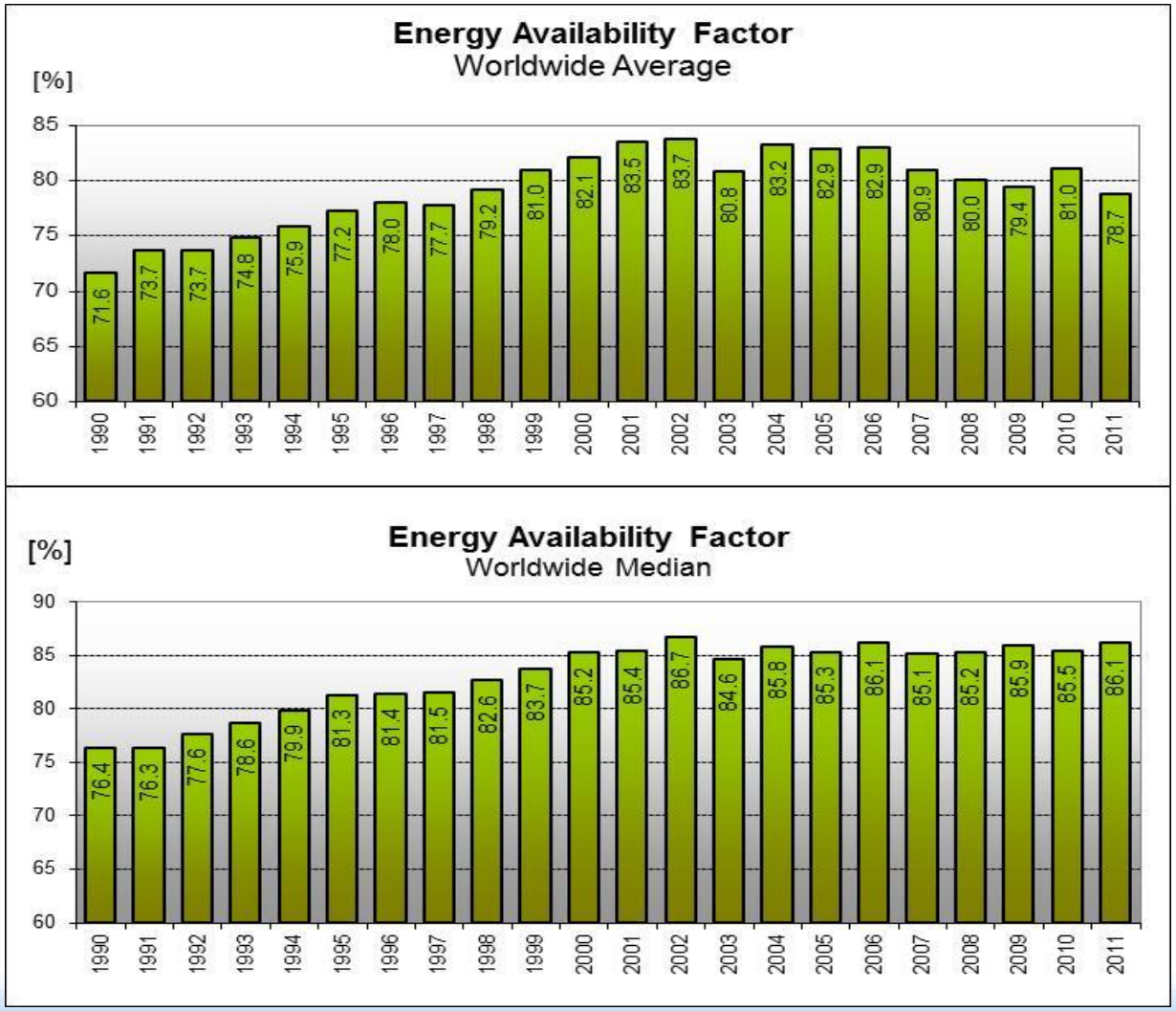
Reference: IAEA-PRIS

Trend in electricity production



Reference: IAEA-PRIS

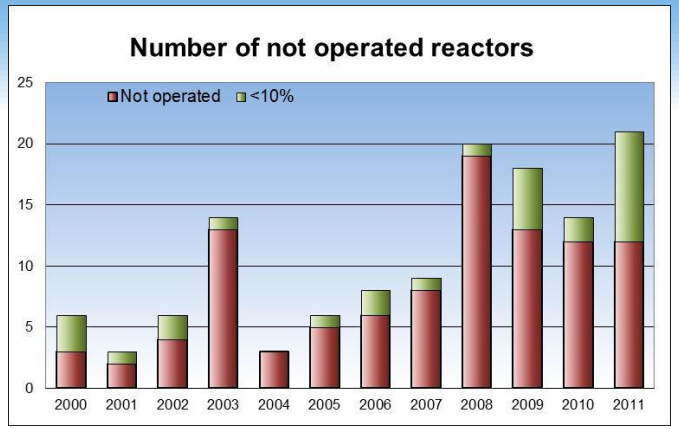
Installed Capacity Utilization

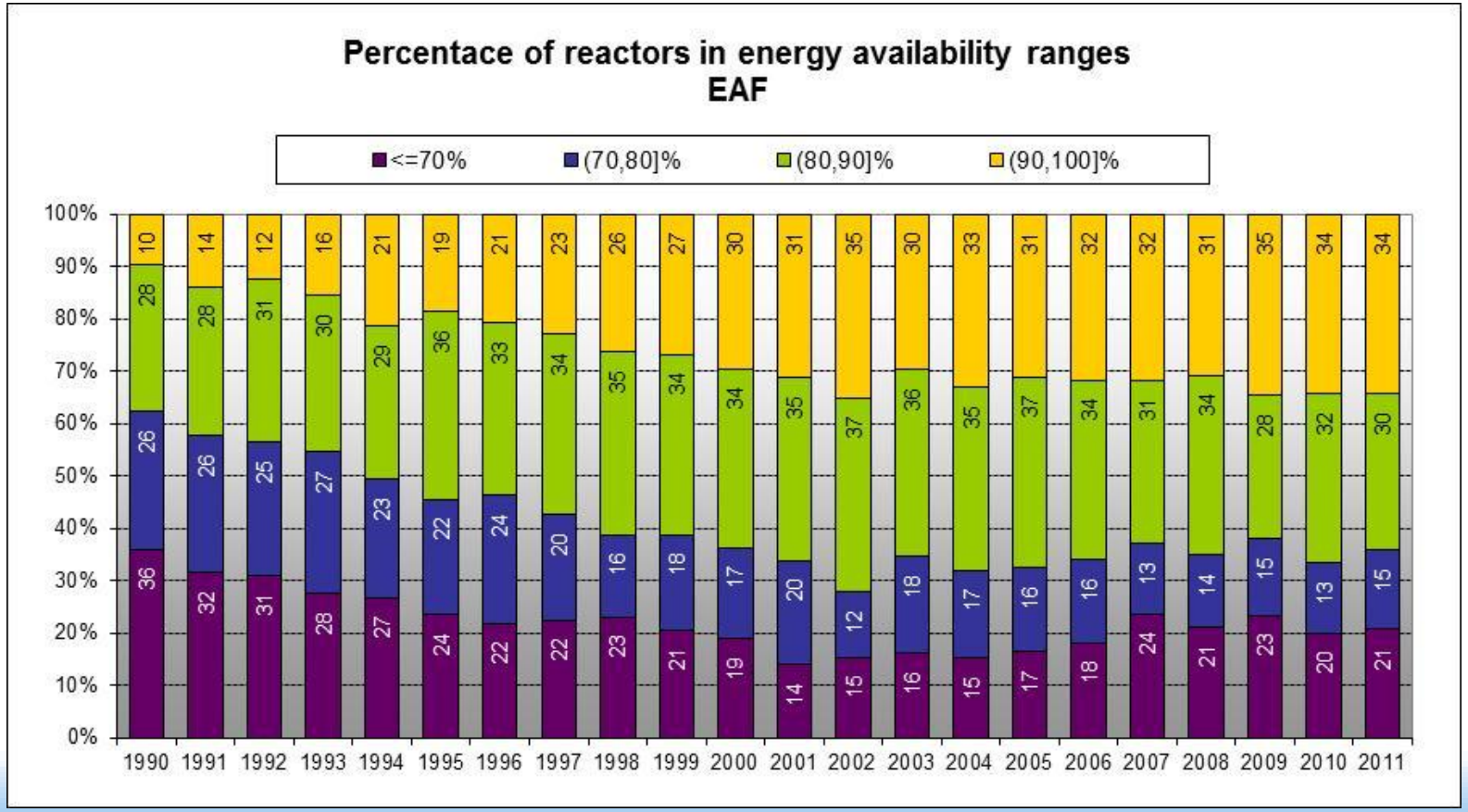


- Continuous increasing trend during 1990s has reversed in last years
- In 2011 the Energy Availability Factor (EAF) dropped to 79% on average.
- Half of nuclear reactors operated with EAF above 86%.

Reference: IAEA-PRIS

EAF in intervals

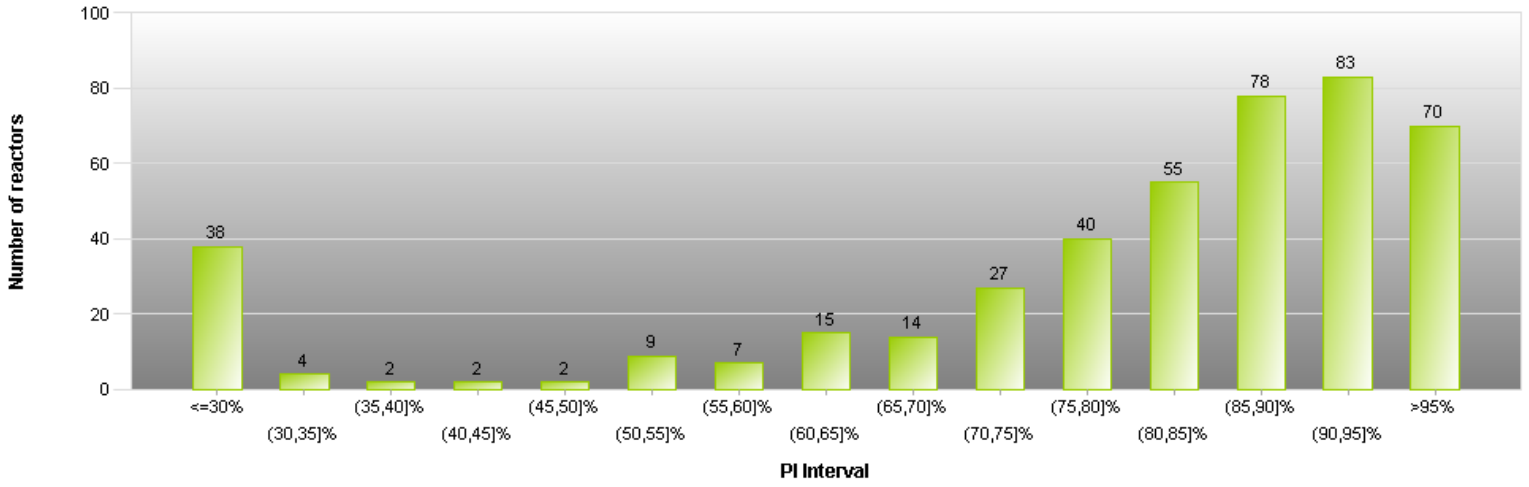




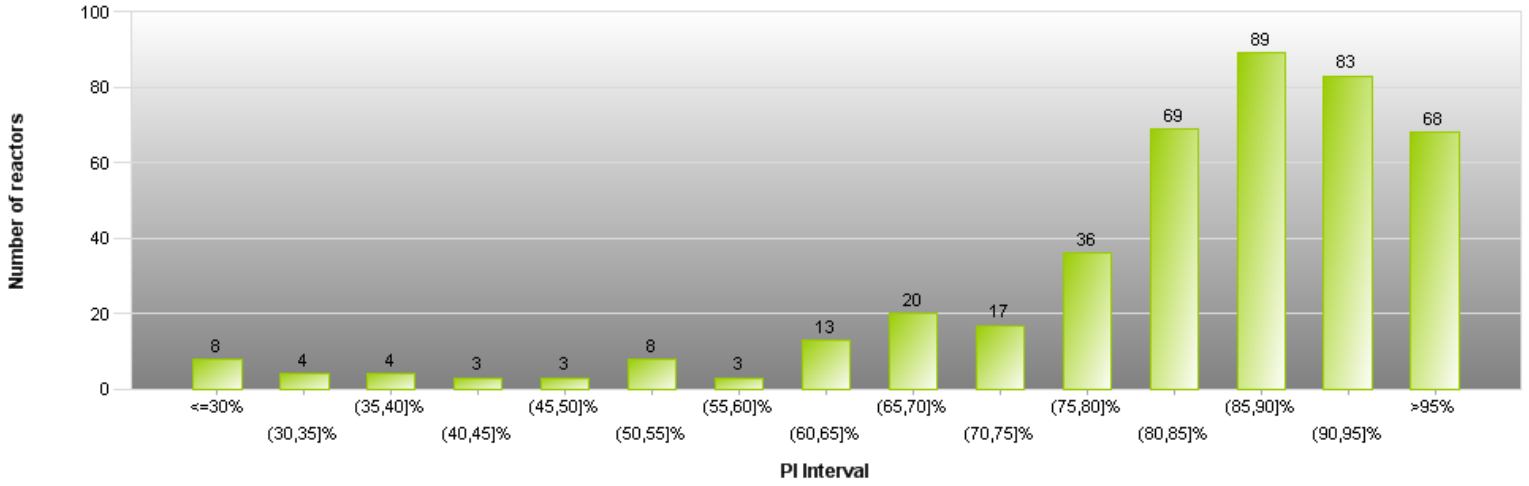
Reference: IAEA-PRIS

EAF histograms

2011

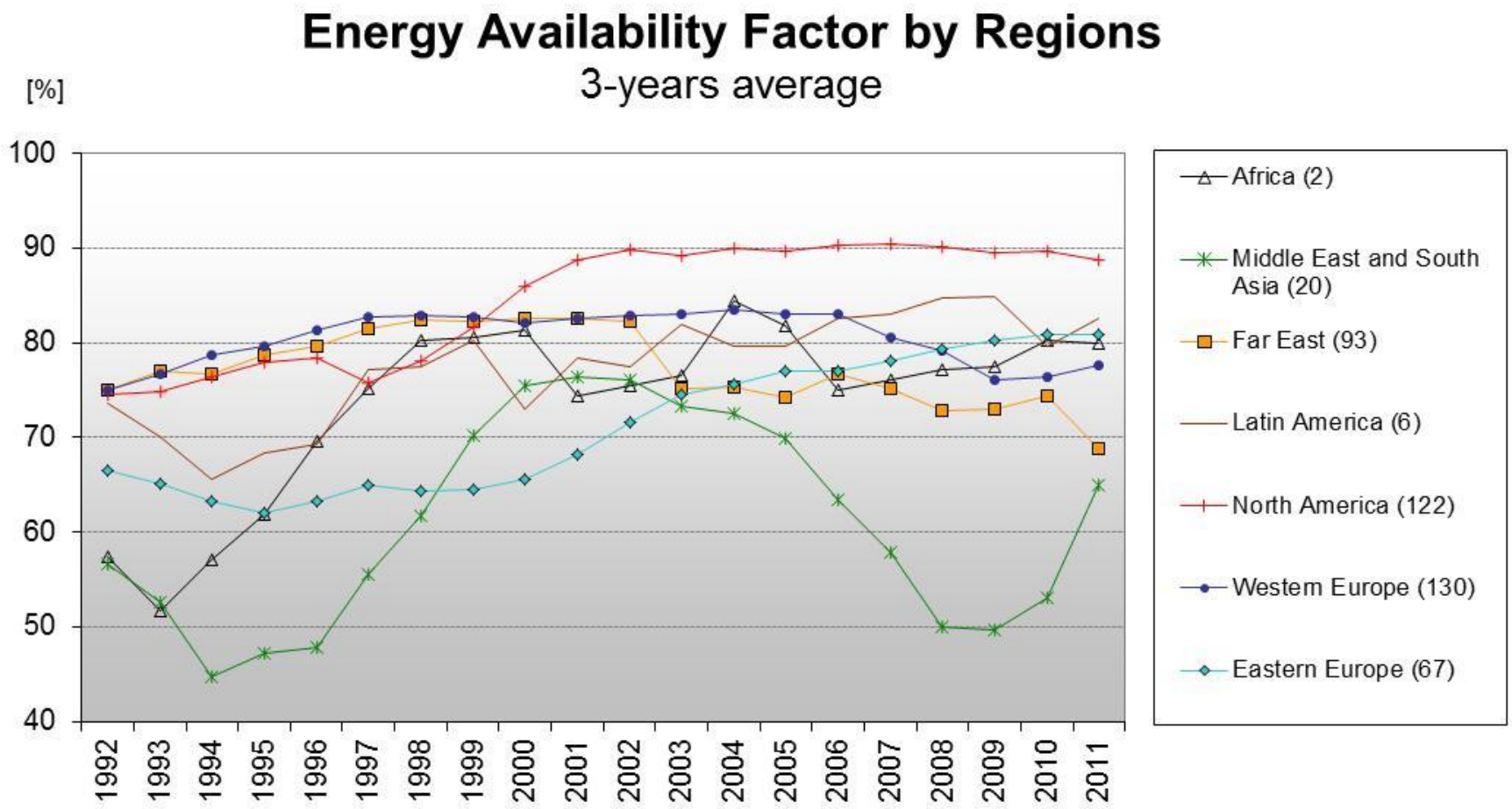


2002



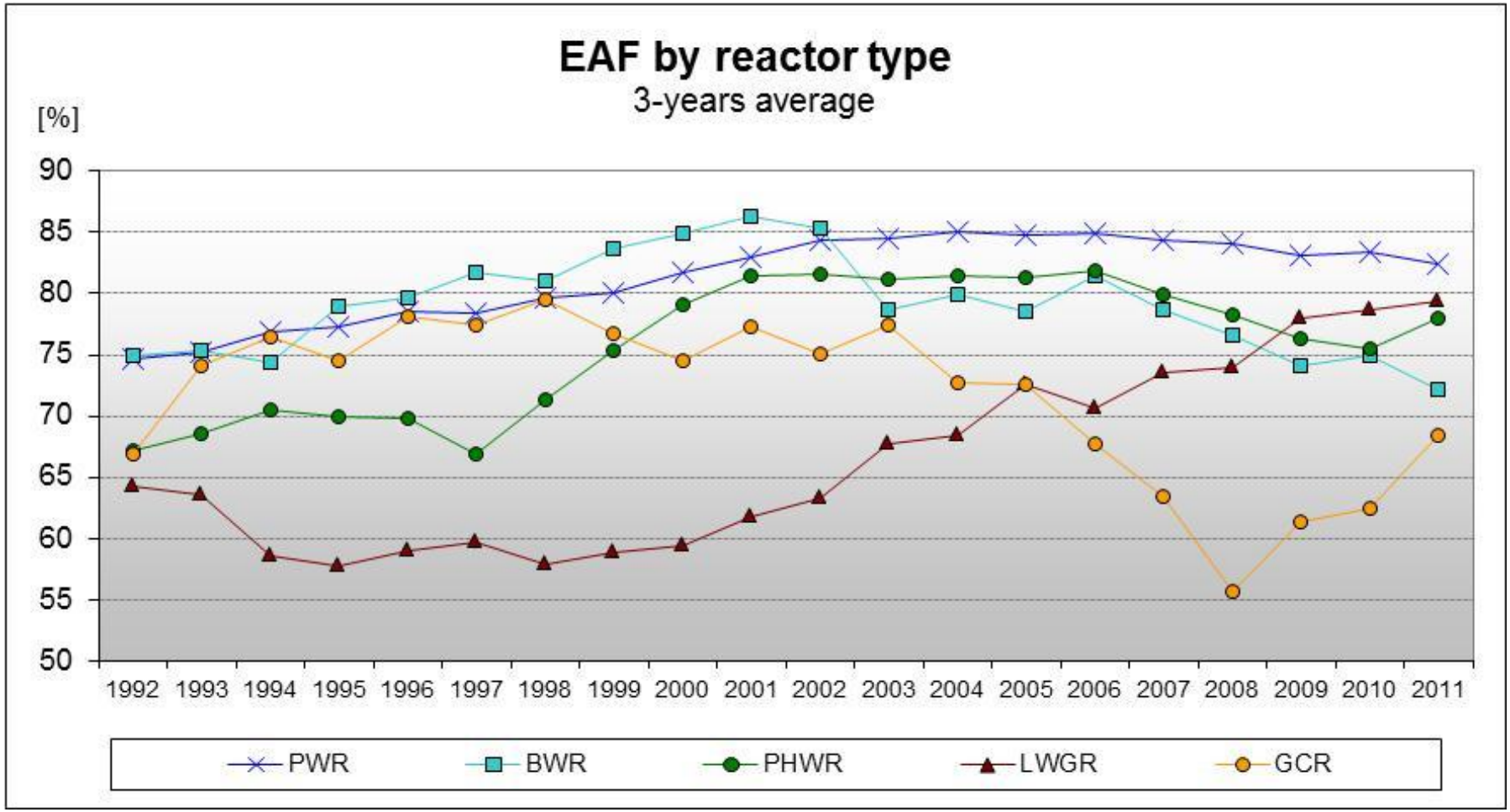
Reference: IAEA-PRIS

Regional trends



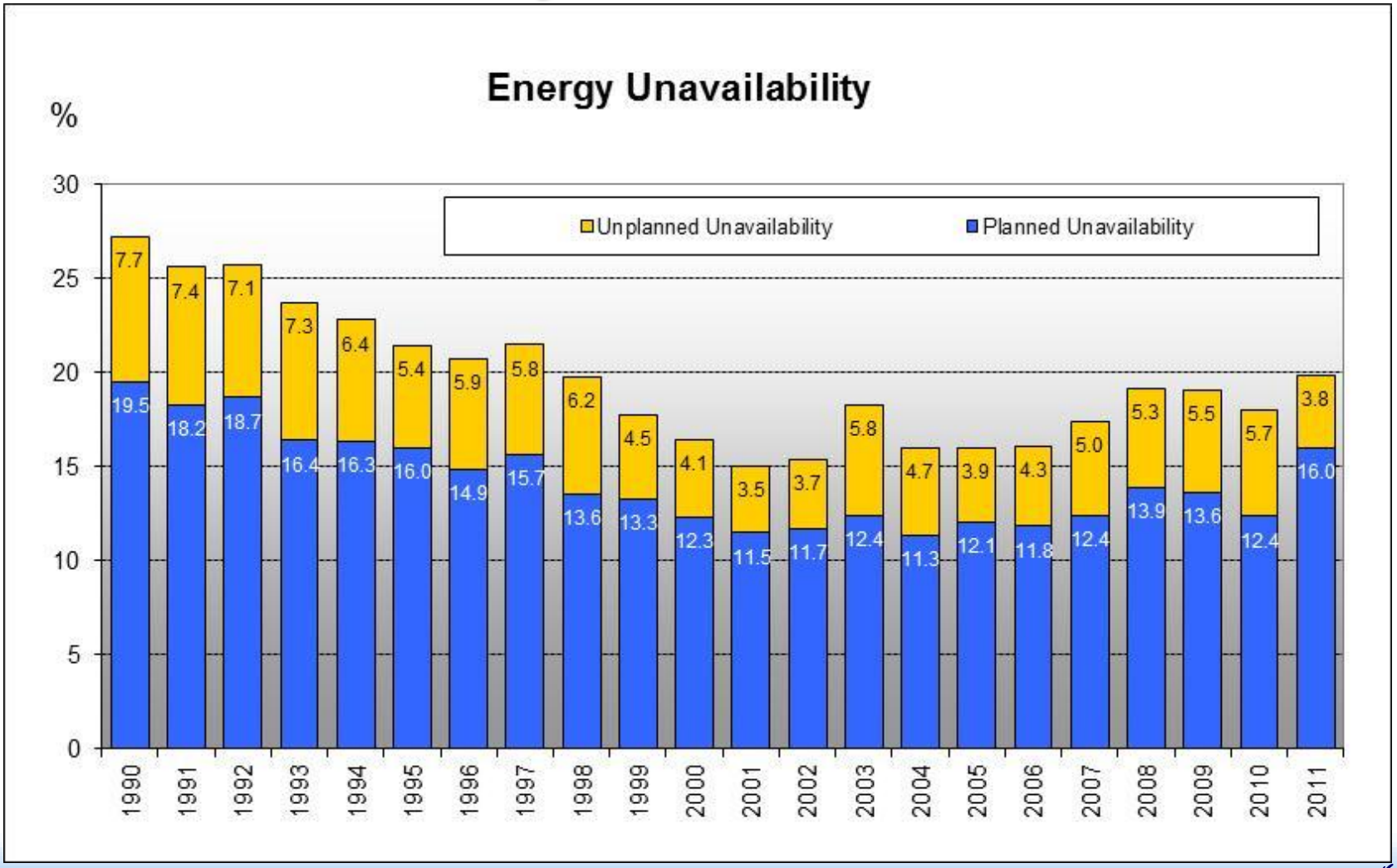
Reference: IAEA-PRIS

Performance by technology



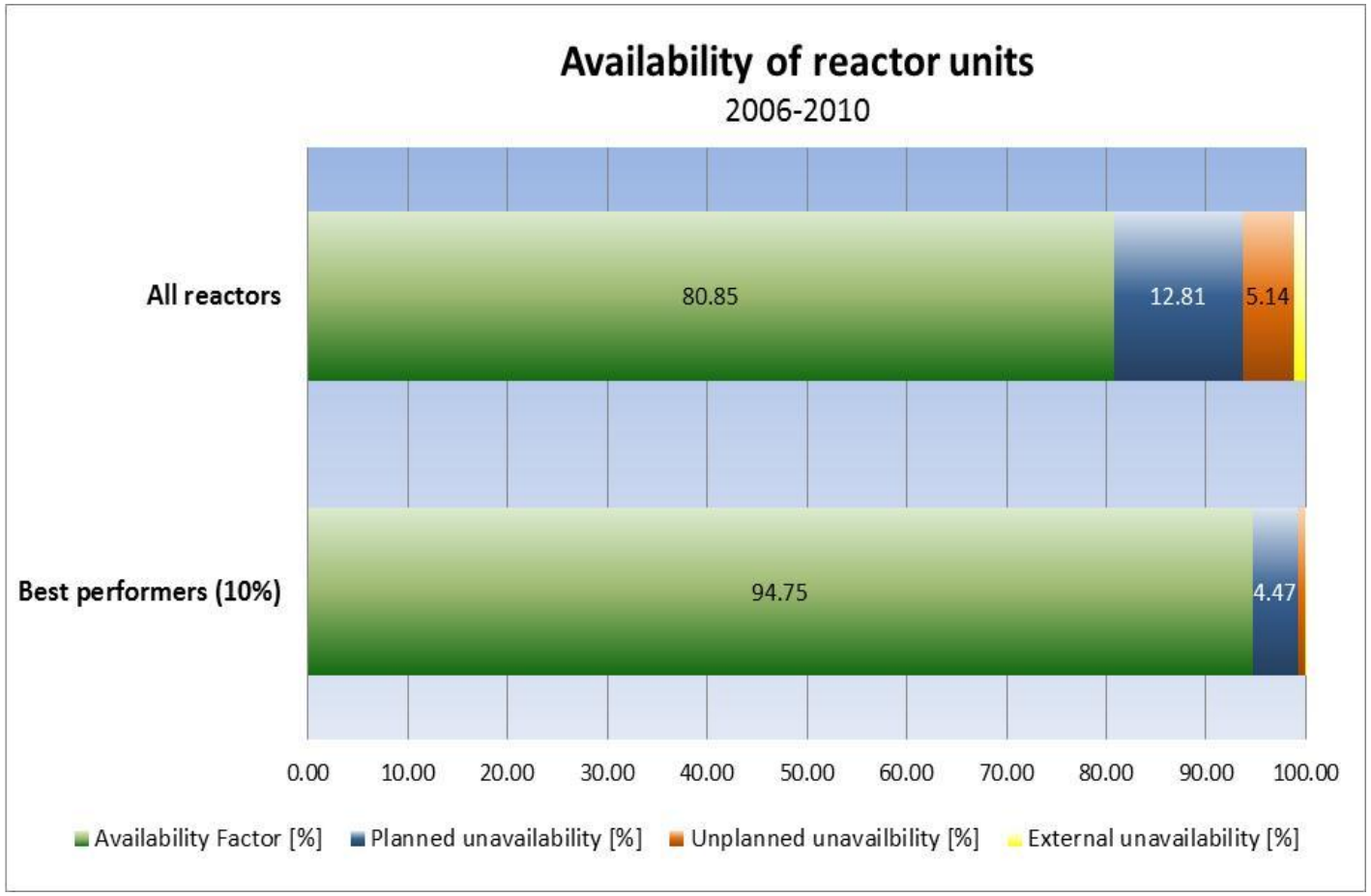
Reference: IAEA-PRIS

Unavailability



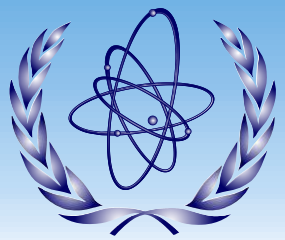
Reference: IAEA-PRIS

Benchmarking



- Who are world-class performance leaders?
- Identification of gaps in performance
- Learning by sharing information and experience

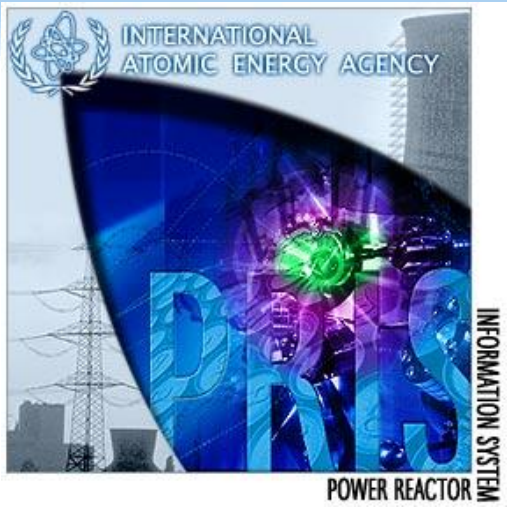
Reference: IAEA-PRIS



International Atomic Energy Agency

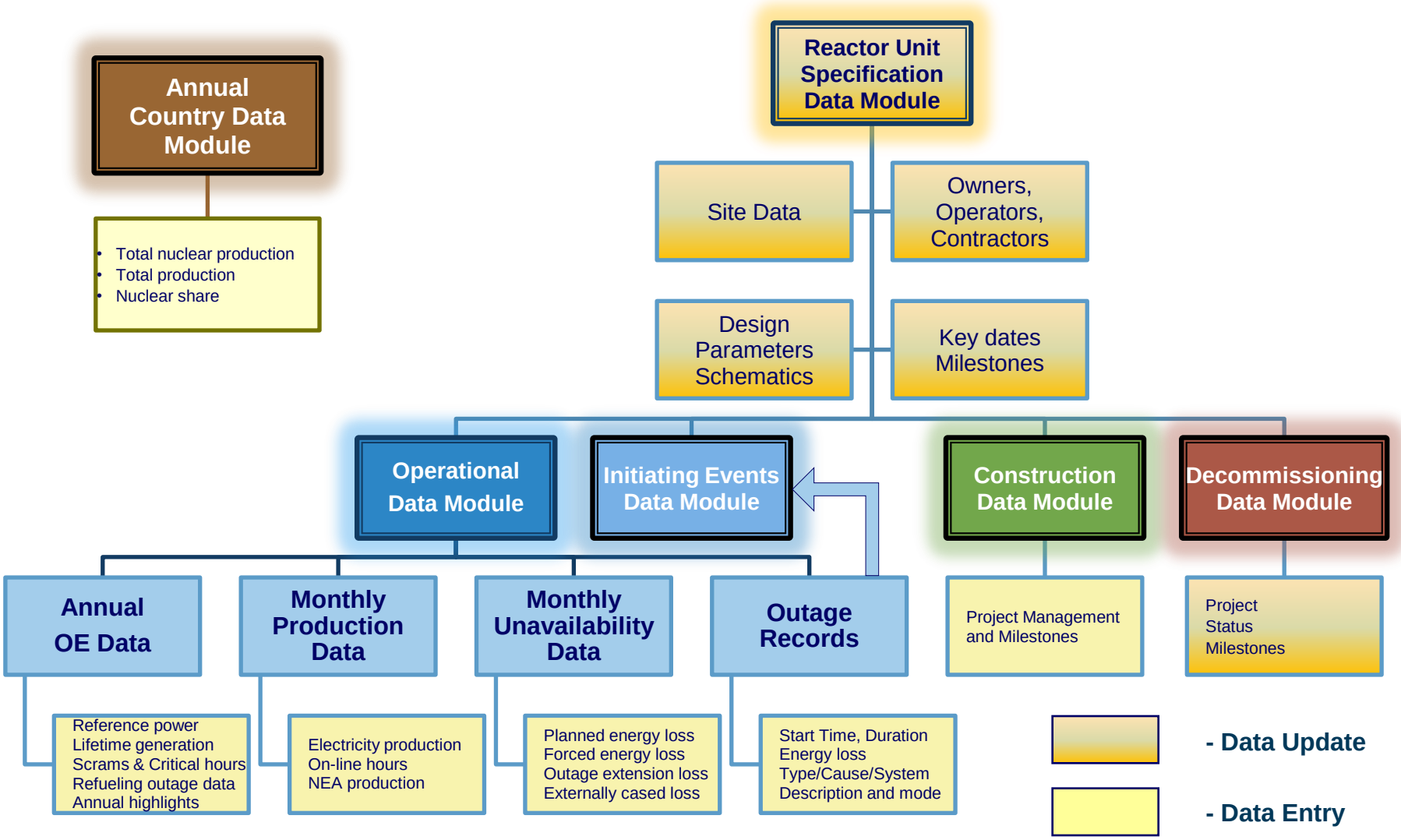
Introduction to
Power Reactor Information System (PRIS)

What is PRIS?



- The most complete databank on nuclear power reactors in the Word
- Reference data source used worldwide
- 40 years experience in data collection on nuclear power status and performance
- Publications and analyses
- Comprehensive reporting system
- Modern on-line communication
- Team of collaborators

PRIS Data Modules



What PRIS provides?

- Monitoring of reactor status and its changes
- Historical development of nuclear power
- NPP specification and design characteristics
- NPP performance analyses using well defined and internationally accepted indicators
- Trend analyses
- Industrial standards – average, median, quartiles
- Process of reactor decommissioning

How to get an access to PRIS?

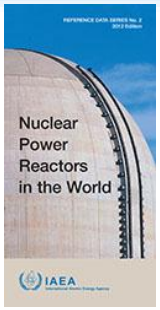
- PRIS Contacts:

  PRISadmin@iaea.org

- Subscription form – PRIS website or on request
- Governmental organizations and NPP operating utilities – directly to IAEA
- Other organizations and individuals – through Permanent Missions

PRIS Outputs

Publications



NPR in the World

since 1981

~2000 pageviews/month

Operating Experience with NPP

since 1970

(now on CD)

~1000 pageviews/month

WEB Applications

WEDAS

Data Entry

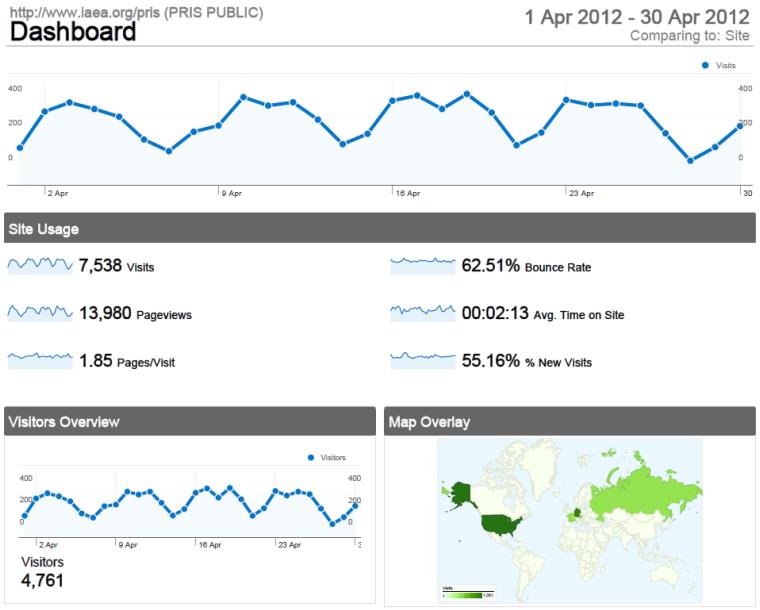
prisweb.iaea.org

PRIS

Public website

www.iaea.org/pris

~ 5000 visits /month



PRISTA

Statistical Reports

prisweb.iaea.org/statistics

~ 1000 visits /month