

Organisation of workshop



Reactor:

Session 1a

- Gen II & Gen III/III+
- Long Term Operation for existing fleet
- Impact of Fukushima (upgrades, design)
- Small (Modular) Reactors
- Gen IV technologies
- Non-electric applications ...

Transverse:

Session 1a

- I&C
- Remote handling
- Proliferation resistance & physical protection
- Security ...

Fuel cycle:

Session 1b

- Front end
- Back end:
 - Waste management
 - reprocessing
- Decommissioning ...

Barriers to Deployment: Session 2

- Standardisation
- Harmonisation
- Licensing
- Supply chain
- Human resources ...

Safety & Regulation

Session 4

- Safety standards, requirements, research
- Regulation
- Institutional aspects (new comer countries)

Economics & Finance

Session 3

- Competitiveness
- Electricity markets
- Financing mechanisms ...

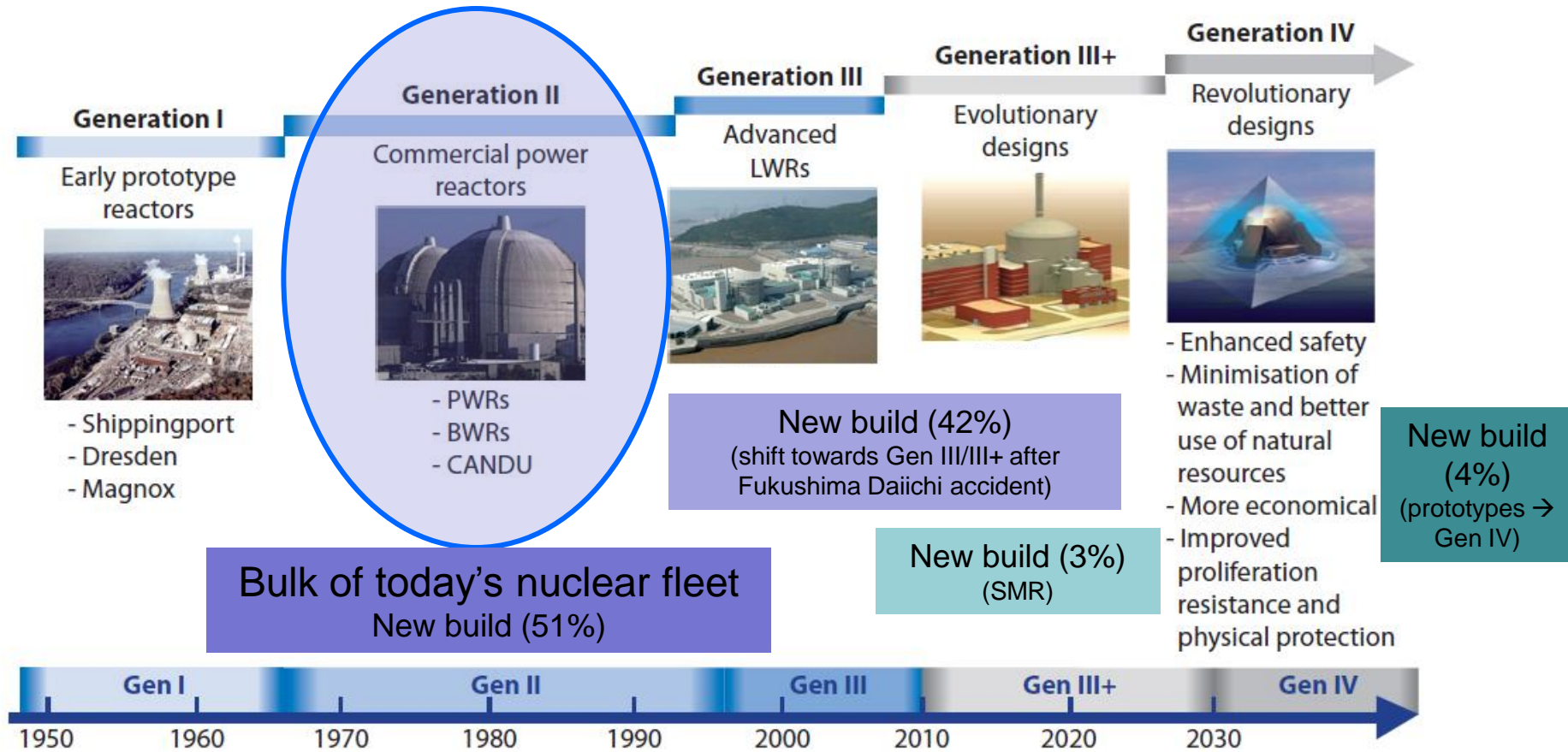
Technology development needs for nuclear energy

1.a: Reactor technology

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IEA / NEA Nuclear Technology Roadmap Update
23-24 January 2014, Paris

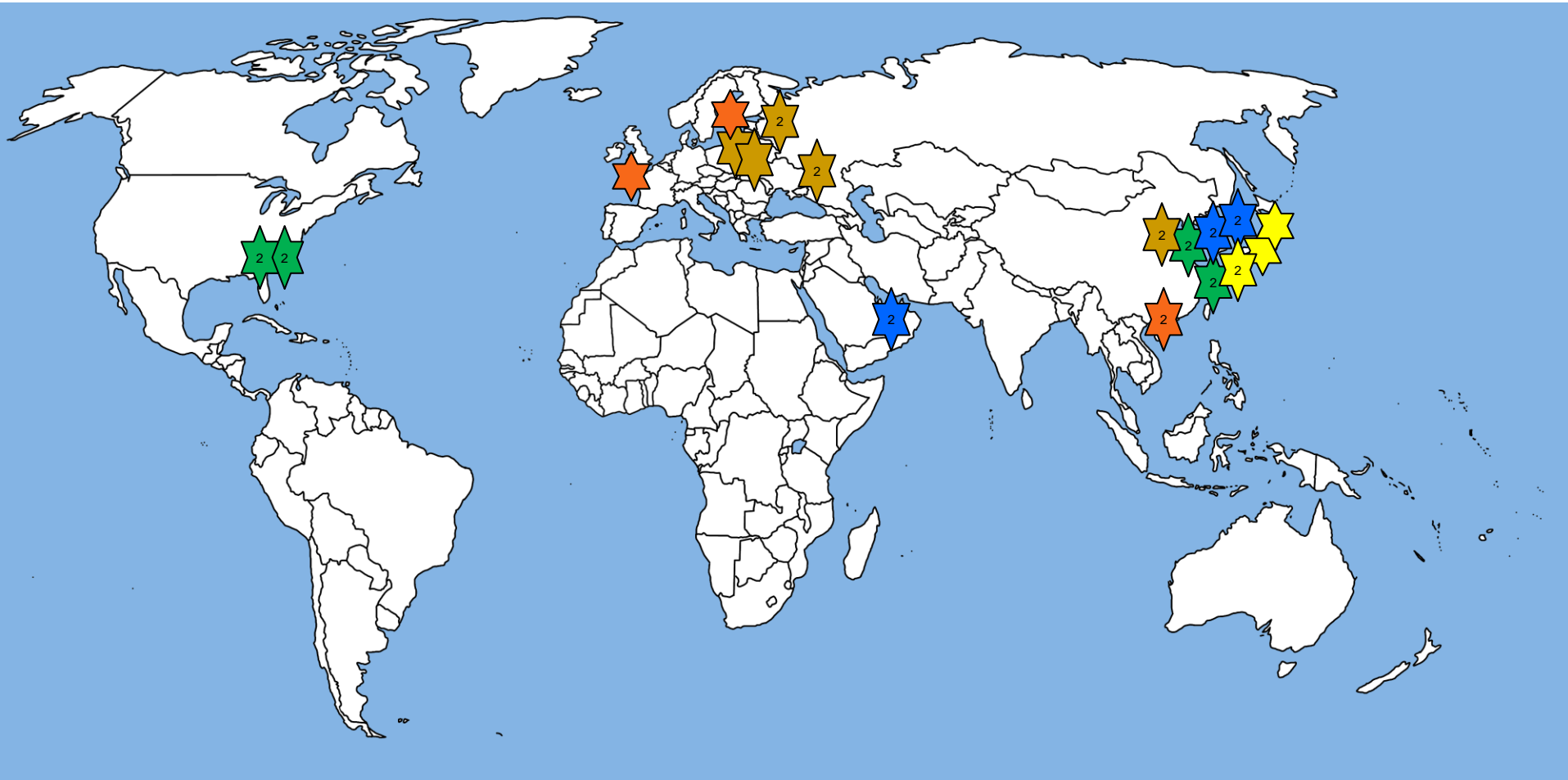
Nuclear Reactors: Generations I to IV



Country	Number	Gen II	Gen III/III+	Other	Type (in bold Gen III/Gen III+)
Argentina	1	1			PHWR
Belarus	1		1		VVER-491
Brazil	1	1			PWR
China	29	20	8	1	PWR, AP1000 , EPR , AES-92 , HTR
Finland	1		1		EPR
France	1		1		EPR
India	6	5		1	PHWR, VVER, SFR
Japan	2		2		ABWR
Korea	5	1	4		APR1400 , PWR
Pakistan	2	2			PWR
Russia	10	2	5	3	VVER1200 , VVER1100, SMR, SFR
Slovakia	2	2			PWR
Taiwan, China	2		2		ABWR
United Arab Emirates	2		2		APR-1400
Ukraine	2	2			VVER1000
USA	5	1	4		PWR, AP1000
Total	72	37	30	5	Representing about 71 GWe net capacity

Gen III/III+ reactors under construction

In IAEA/PRIS database (end 2013): 30 out of 72 reactors under construction are Gen III/GenIII+



★ AP1000
Sanmen (2), Haiyang (2),
Vogtle (2), Summer (2)

★ EPR
Olkiluoto, Flamanville,
Taishan (2)

★ ABWR
Ohma, Shimane,
Lungmen (2)

★ APR-1400
Shin-Kori (2), Shin-
Ulchin, Barakah (2)

★ VVER 1000/1200
Novovoronezh (2), Leningrad (2),
Baltik, Ostrovets, Tianwan (2)

- **Safety**
 - Severe accident research, mitigation, safety upgrades, improved assessment methods (deterministic & probabilistic), human & organisational factors
- **Competitiveness**
 - Better exploitation of energetic content of the nuclear fuel (high burn up, optimised fuel assemblies) (but more challenging for materials, ageing), need more accurate core management modelling tools and instrumentation
 - E.g. power uprates
 - Equipment monitoring & maintenance techniques [I&C, robotics, remote handling, ...] & sophisticated core management → longer cycles, shorter maintenance and refueling outages, → high availabilities
- **LTO**
 - (understanding of physical phenomena of ageing, irradiation and corrosion)
 - Characterisation methods, modelling, in-service inspection, non destructive testing
- **Management of waste:**
 - Management of low level waste including decommissioning of nuclear installations (including transport and disposal), reducing LLW effluents and discharges
 - High level waste repositories (geological disposal)
- **Fuel cycle:**
 - For countries reprocessing spent fuel: improved separation, reprocessing & vitrification processes and technologies to reduce effluents, reduce waste volume, extend range of fuels to be reprocessed and waste to be vitrified.

- **Construction:**
 - More standardised design to reduce licensing time, capital costs and construction time
- **Operation:**
 - Higher flexibility (e.g. load following capabilities)
 - Higher availability, longer operating life (60 years)
- **Safety:**
 - Reduced probability of core melt accidents
 - Minimal effect on the environment in case of severe accident (consequences limited to NPP)
- **Cross-cutting:**
 - Digital technologies (advanced diagnostics, reliability, human performance support...)
 - But: Regulatory uncertainty & business risk uncertainty delaying deployment of new technologies
- **Others...?**

- **Your views on:**
 - technologies, their potential, their deployment “target” (markets)
 - How can technology help bring costs down
 - Barriers, technological or not
 - R&D challenges
 - Operational challenges
 - Resilience / robustness against future challenges (electricity systems with high % of var. RES, Climate Change, ...)
 - Best practices, lessons learnt
 - Policy recommendations
 - ...

Let the discussion begin...