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AN APPROACH FOR RESPONSIBLE NUCLEAR SUPPLY AFTER FUKUSHIMA

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India as a New Nuclear Supplier
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Outline

- Context (5 slides)
- Why need "responsible" nuclear supply? (7 slides)
- Potential Approaches (5 slides)
  - Vendors
  - Bilateral/unilateral governments
  - Multilateral/international
- Questions for discussion (1 slide)

Starting point

- Conventional wisdom: Nuclear supply follows free market competition and nuclear suppliers only need to follow government legal restrictions
- Reality: Government policies have huge impact on terms of nuclear supply, from NSG guidelines to nuclear cooperation agreement requirements to export financing terms. Suppliers make choices based on their risk assessment. Recipients (operators, governments, financiers) can increase or reduce risks.
- Responsible nuclear supply: Requires efforts by governments and suppliers and recipients.

Is there a universal definition of responsible nuclear supply?

- No. Increasing talk of "nuclear governance" as it relates to nuclear safety & nuclear security, particularly post-Fukushima.
- Nuclear governance as it relates to nonproliferation handled under NPT, Nuclear Suppliers Group.
  - NSG not universal, but members generally follow principle of "no undercut".

Defining responsible nuclear supply

- DOES NOT INCREASE RISKS OF RELEASE OF RADIATION TO THE ENVIRONMENT, PEOPLE OR SOCIETY
- Radiation release could come from
  - Nuclear explosive
  - Radiological dispersal device
  - Accident
- Elements of responsible nuclear supply
  - Nonproliferation
  - Nuclear security
  - Nuclear safety

Is responsible nuclear supply different after Fukushima? Yes,

- Not because Fukushima could have been prevented by better nuclear governance, but impact possibly could have been mitigated with better nuclear governance in place.
- Also, pause in construction could affect scale, pace & costs.
- Some suppliers will get out of the game
  - Siemens already; Japanese?
  - Question of markets – without a domestic marketcan exports be competitive?
- Before Fukushima, cost paramount. Safety after?

Is responsible nuclear supply different after Fukushima? No…

- Nuclear "newcomers" that go forward (e.g., Vietnam, UAE, Saudi Arabia) won't be as constrained as existing nuclear power states
  - By public opinion
  - By need to "retrofit" existing reactors
  - By need to revamp existing regulatory systems
- Holistic approaches for the system more difficult to engineer than patchwork regimes so any changes likely to be incremental

Risks of Expanding Nuclear Energy

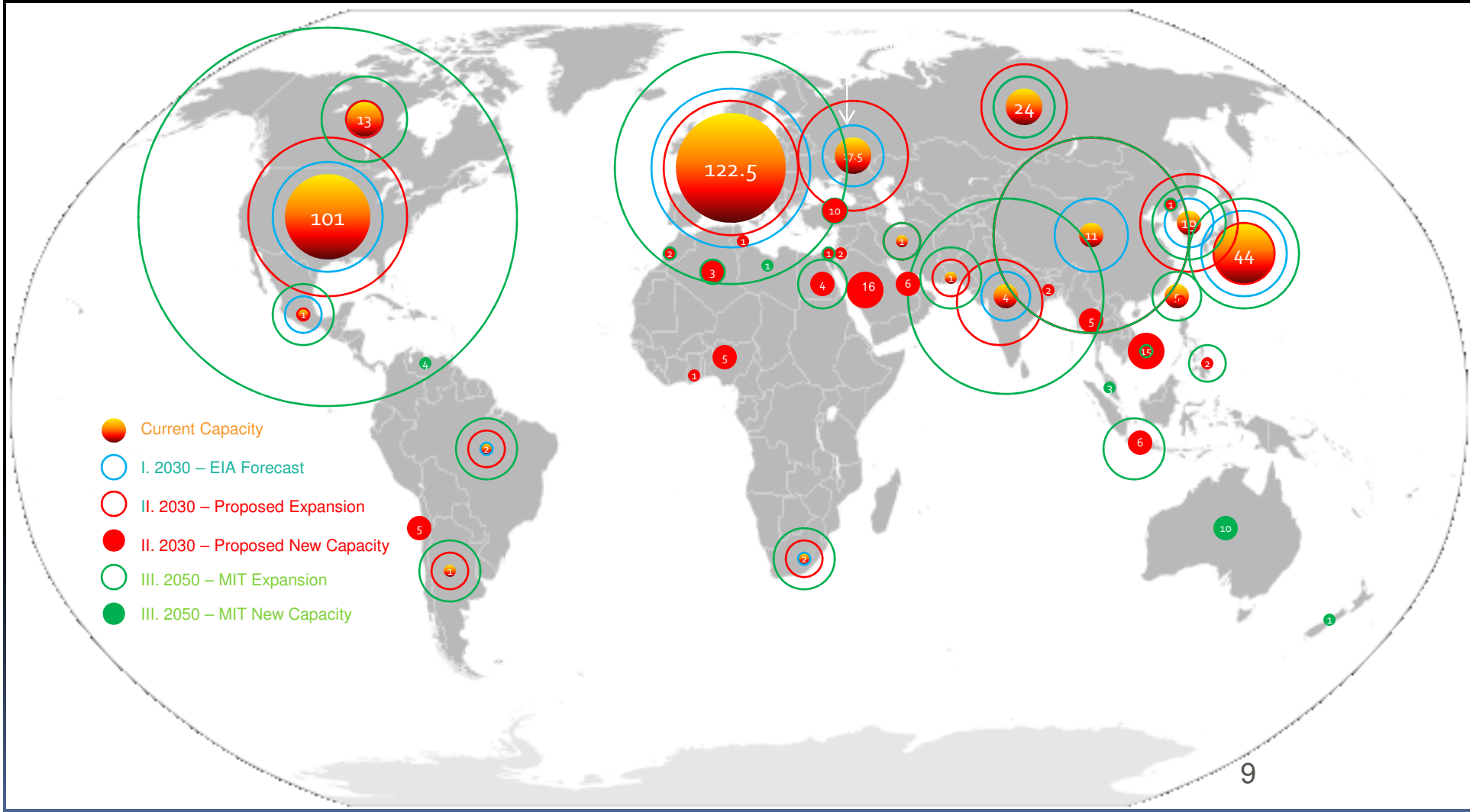
- **Potentially more reactors AND**
  - **New kinds of nuclear reactors – SMRs? Floating reactors? Fast reactors?**
  - **New suppliers – ROK, China, India?**
  - **New locations – Middle East, Southeast Asia**
  - **New fuel cycle capabilities – enrichment & reprocessing?**

- **Fuel cycle issues unlikely to go away (and become more significant if we really desire a world free of nuclear weapons)**

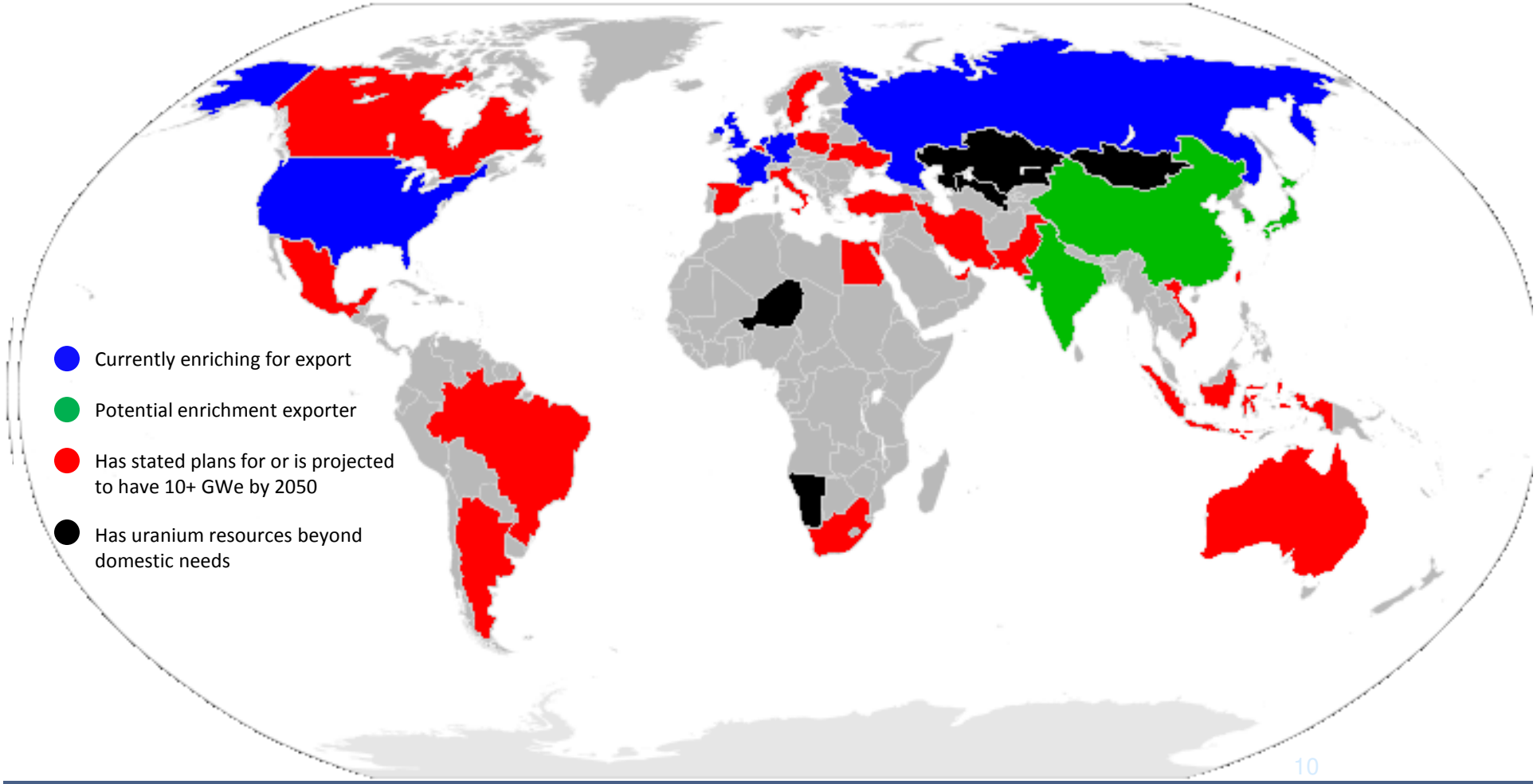
Reactor Capacities for all Scenarios

(as of Dec 2011)

If the "Renaissance" Moves Forward, the Nuclear-powered World Will Look Very Different In 2050 Than It Does Today.



Current and Potential Future Enrichers of Uranium



* = Some countries fit in more than one of these categories and are listed by the first one in which they appear.

Proposed "New" Nuclear States

as of December 2011

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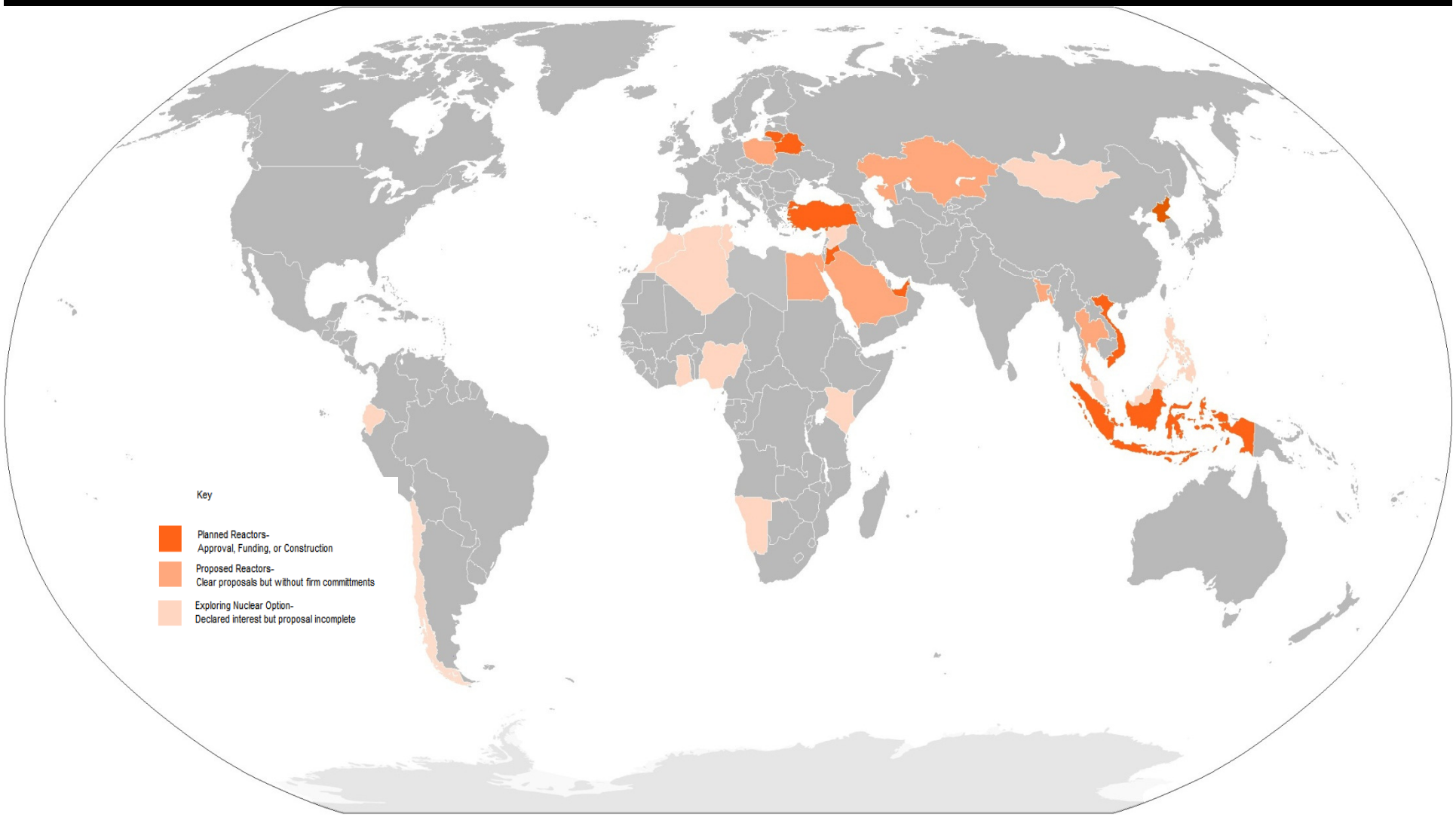

Overlay of FP's Failed States Index 2011

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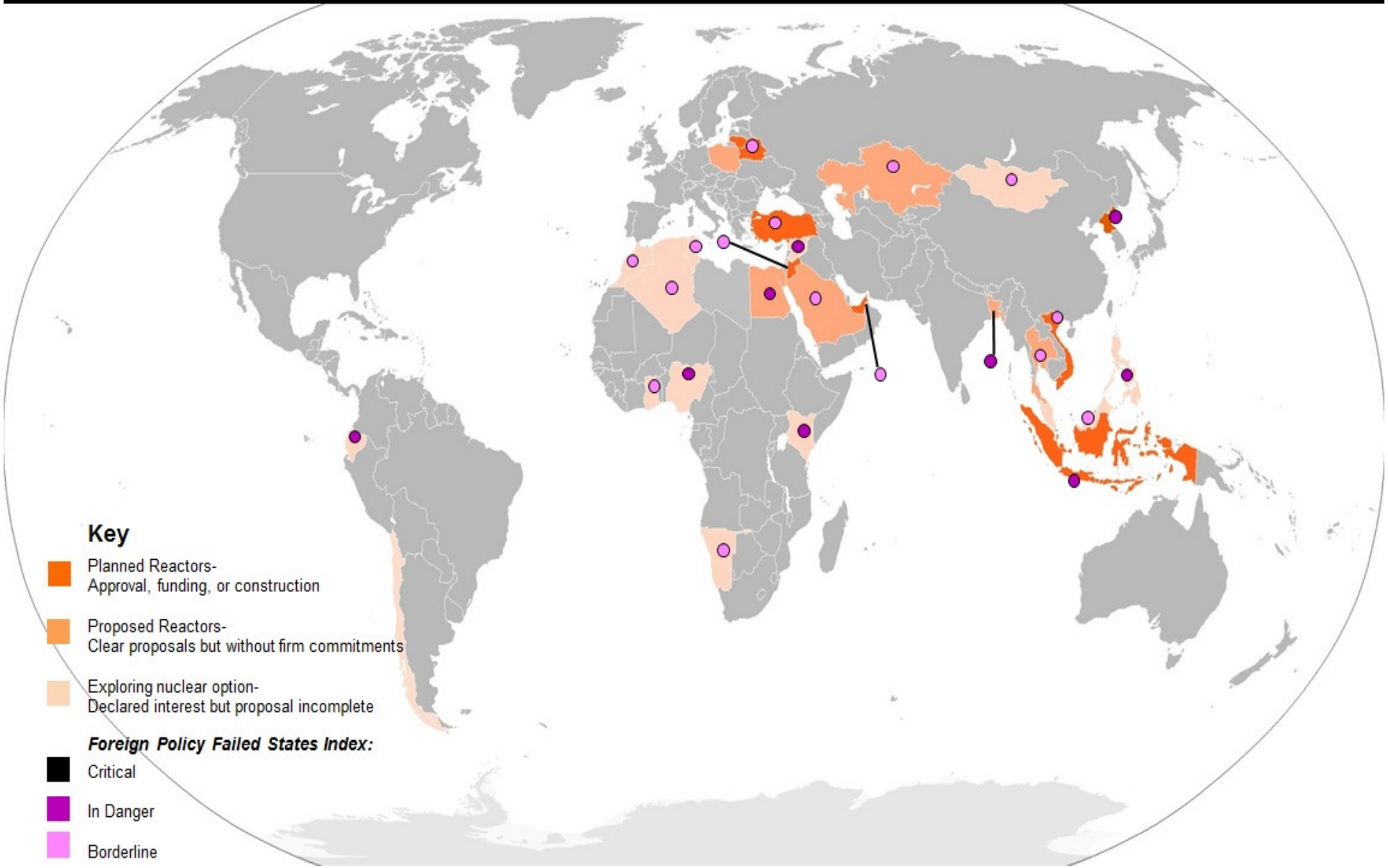

New nuclear states' capabilities affect safety, security, & proliferation risks

- Physical, intellectual nuclear infrastructure
  - **Where are they in the IAEA process?**
    - **Knowledgeable commitment (Milestone 1)**
    - **Readiness to invite bids (Milestone 2)**
    - **Ready to commission and operate (Milestone 3)**
- Legal, financing, regulatory frameworks
- Safety, security cultures?

Bottom Line

- No matter what, need to shape nuclear energy to reduce risks. Long-term sustainability of nuclear energy likely requires more global governance in following areas:
  - Nuclear safety
  - Nuclear security
  - Fuel cycle limitations (enrichment/reprocessing) for nonproliferation reasons.

- Will require all states, all stakeholders to reduce risks.

A few "governance" objectives

- **Enhance focus on security**
  - Nuclear Security Summit 2012
  - World Institute for Nuclear Security
  - Better adherence to international standards (amended CPPNM)
- **Limit amount of directly weapons-usable nuclear material growth**
  - Discourage Pu, HEU use in civil cycle
  - Promote LEU, open fuel cycle, limiting spread of sensitive fuel cycle facilities
- **Reduce risks from the fuel cycle** – not just front end (enrichment, fuel) but also back end (spent fuel, waste).

Approaches

- At vendor level
  - Codes of conduct, etc.
- Unilateral/Bilateral government actions
  - Export licensing
  - Nuclear Cooperation Agreements
- Multilateral/international
  - Nuclear Suppliers Group Guidelines

Nuclear Governance: Vendor Approaches

- Nuclear Principles (Nuclearprinciples.org); 2011
- Vendors: CANDU, Ge-Hitachi, Westinghouse, Atomstroyexport, Areva, Mitsubishi, Atmea, Toshiba
- Covering:
  - Safety
  - Security
  - Environment
  - Compensation for Nuclear Damage
  - Nonproliferation
  - Ethics
- Dual-use exporter voluntary actions
  - E.g., Oerlikon's sharing of information with government about rejected export requests

Nuclear Governance: Unilateral, Bilateral Approaches

- **Export licensing**
  - **Equipment**
  - **Technology, know-how (Part 810 in U.S. system)**
- **Export promotion**
  - **Governments can choose not to single out nuclear energy (a la Sarkozy) but offer comprehensive energy advice**
    - Promote *all energy options* (especially efficiency) and *all approaches*, including regional facilities, cross-border electricity transmission, regional fuel cycle centers
- **Nuclear Cooperation Agreements**
  - **Can go beyond NSG requirements (e.g., commitments not to domestically enrich/reprocess; Additional Protocol)**

Nuclear Governance: Multilateral, International Approaches

- Within the Nuclear Suppliers Group
  - Additional Protocol as condition of supply
  - Greater transparency and harmonization of nuclear cooperation agreements
- Promote multinational voluntary approaches
  - Enrichment providers should open up to investment (e.g., KEPCO, US LES)
  - Reinvigorate global campaign for international repository
  - Fund regional storage repositories
- Reshape FMCT negotiations for legally binding e/r restrictions
  - Require multinationalization of all sensitive fuel cycle facilities to level the playing field; give FMCT a real disarmament job; divert the "rights" argument away from the NPT
  - Argument: If not making fissile material for weapons, do we need national facilities?

Questions for discussion

- Liability protections
  - As an exporter, what kinds of protections would India seek?
- Learning curve for export licensing
  - What are biggest issues for India?
- Nuclear fuel cycle R&D
  - Costs, benefits of thorium fuel cycle proliferation
- Technology transfer
  - What are industry and government views on technology transfer in contracts?

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