Nazarbayev University Kazakhstan
Energy Transitions:
Exploring the nexus of Sustainability, Economy and Climate

The Future of Nuclear Energy

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Atomic power plants' share in global electricity generation decreased from 17.5% in top-year 1996 to 9.2% in 2022 (WNISR, 2023)

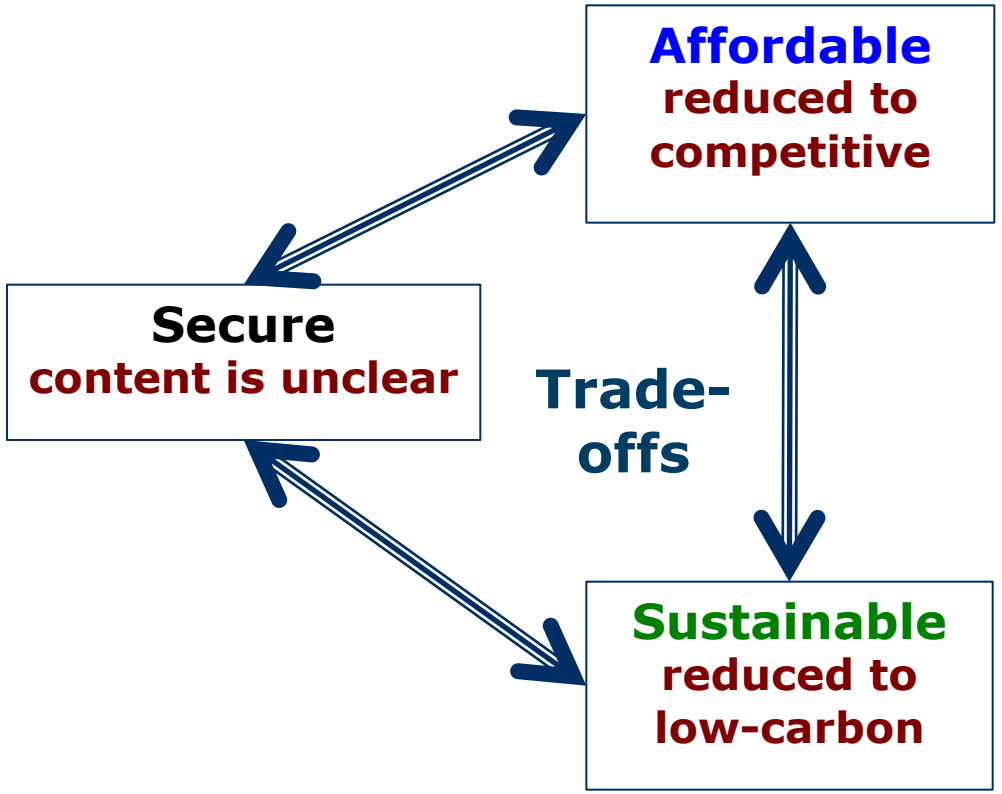
Overview:

- **Sustainability assessments: fake versus real**
- **Atomic power is thermal power**
- **Atomic electricity conflicts with electricity from PV and wind**
- **Discourse dazzles people**
- **IAEA infiltrates IPCC and UNFCCC**
- **Salient points to remember**

ANNEX: detail about IAEA's disguise inside IPCC Working Group III

EU Energy Policy: official ⇔ sustainability vision

Policy goals framed as TRILEMMA



Actual CASCADE

1. Sustainable energy
= ambient renewable energy flows
= nature decides where & when & how much energy currents are available

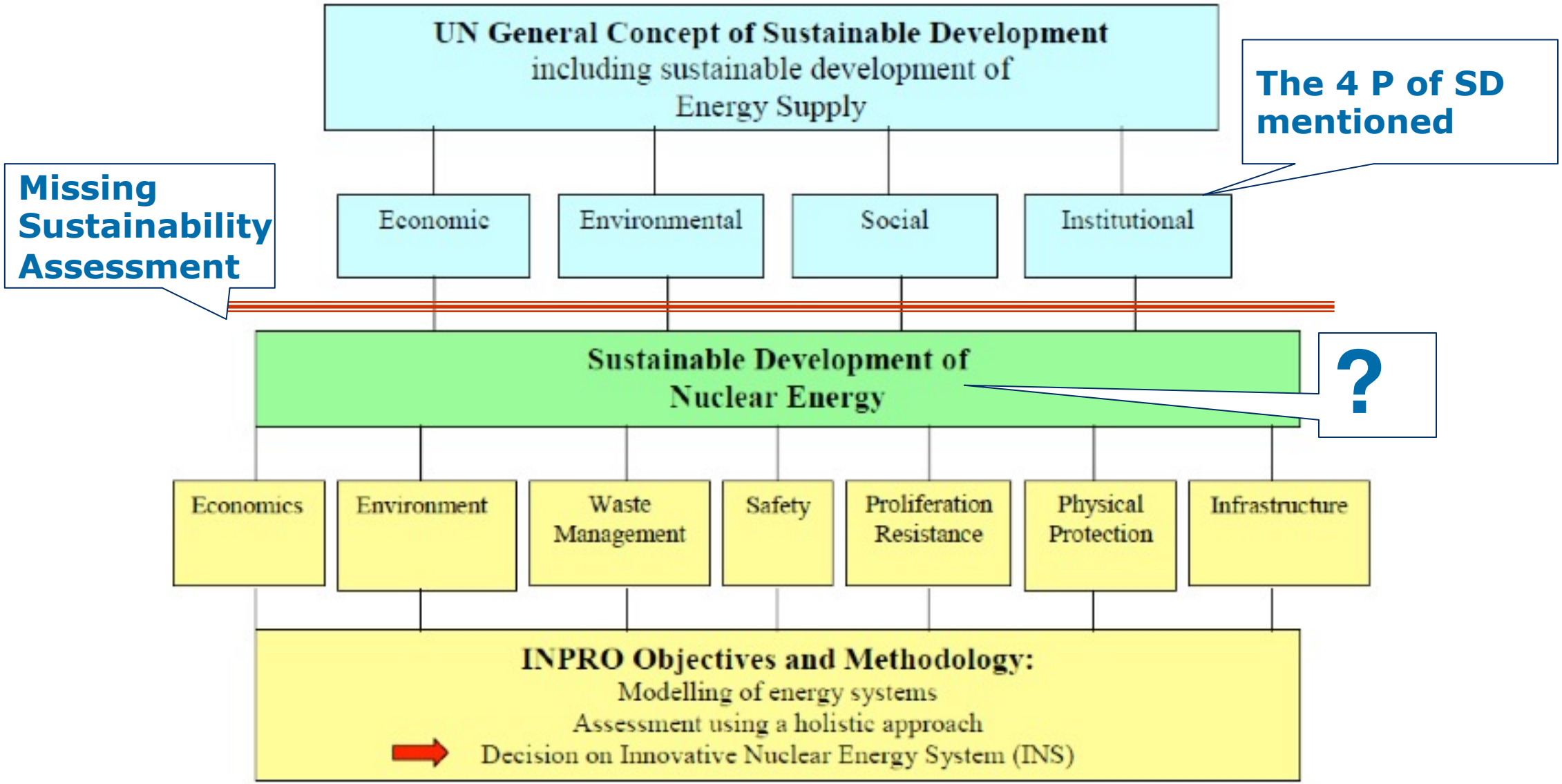
2. Secure
= sufficient for Sustainable Development
≠ all energy wishes instantly satisfied
[security ≠ reliability ≠ obesity]

3. Affordable
by technological innovation:
Redundant renewable electricity generation capacities in Photovoltaics

International Atomic Energy Agency (IAEA) uses an assessment framework INPRO International Project on Innovative Nuclear Reactors and Fuel Cycles

- Techno-economic modelling asserts the 'need' for nuclear power of a country
- Without real Sustainability Assessment, nuclear power is stamped 'sustainable' as an evident prior.
- Compliance with the enacted IAEA standards is the IAEA criterion for labelling atomic power sustainable.
- Hence, IAEA assumes present practices to be sustainable.
- Hence, real Sustainability Assessment is circumvented.
- In practice, pressure exists to weaken standards, e.g. human exposure doses to radiation; dumping radioactive water in the Pacific ocean.

IAEA – INPRO + comments

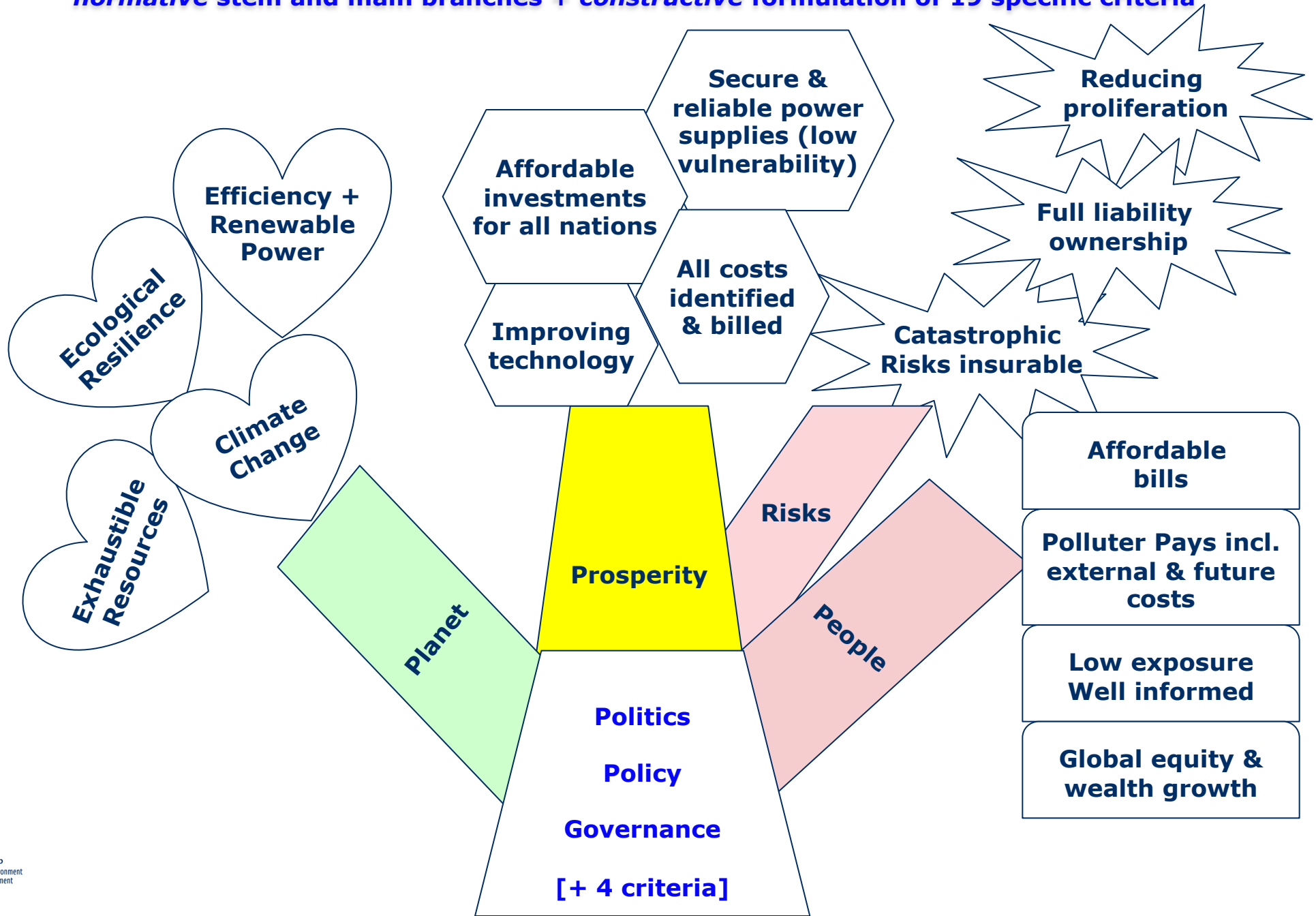


Missing Sustainability Assessment

The 4 P of SD mentioned

?

Sustainability Assessment's explicit criteria (attributes to hold, results to obtain) are shown as a tree with *normative* stem and main branches + *constructive* formulation of 19 specific criteria



Governance, Policy, Politics is the Stem of Realizing & Assessing Sustainability, and should perform on 4 specific criteria

Governance

Policy

Politics

A Global, independent agency studies nuclear power issues and choices in light of its longevity, uncertainties, and irreversible impacts

Independent and accountable nuclear regulatory institutions and processes are established and publicly monitored

At national-regional levels, public interest prevails over private profit, and democratic institutions prevail over technocracy

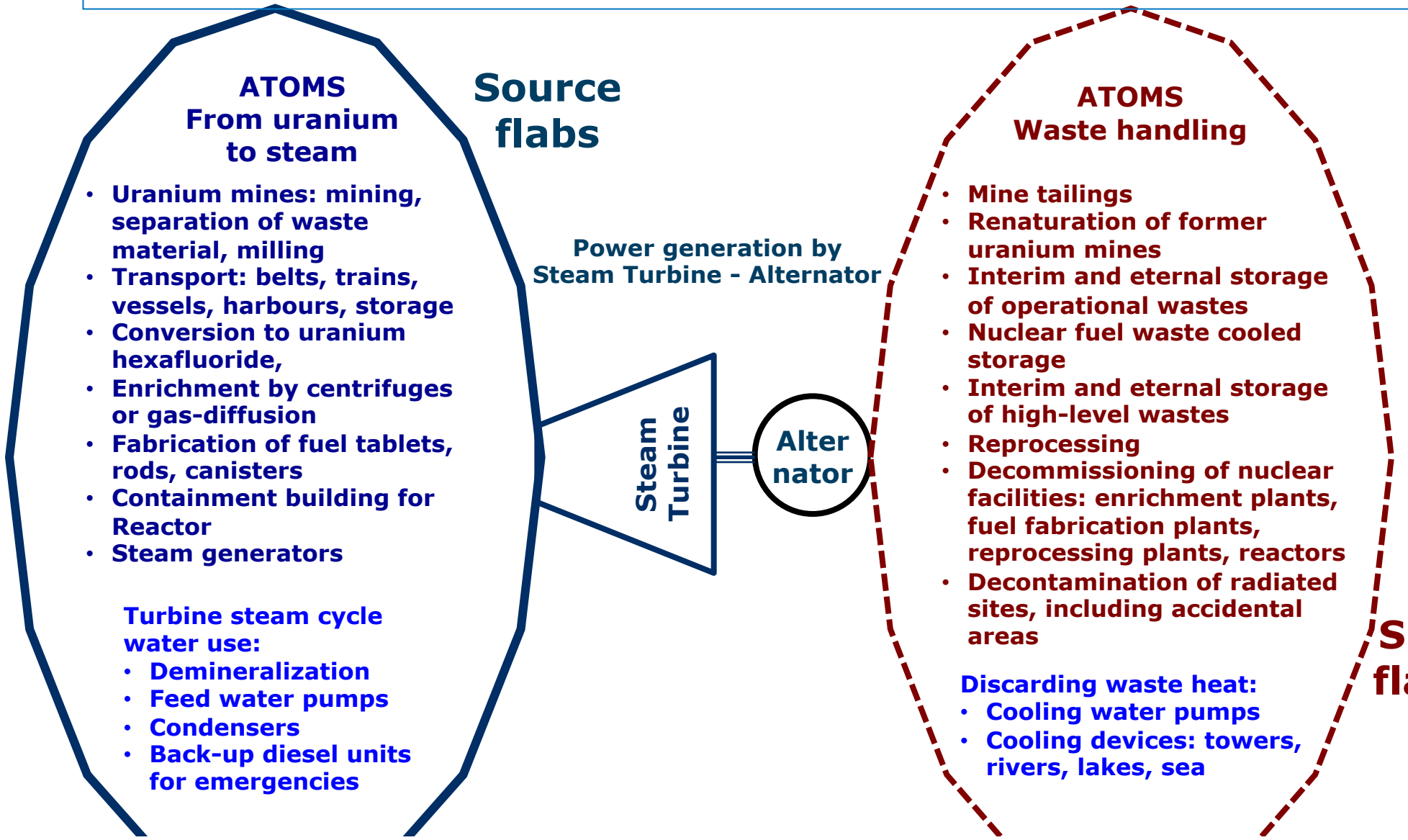
At local levels, citizens can deliberatively commit in energy system governance, and participate in deployment of local energy systems

Source: Verbruggen, A., Laes, E., Lemmens, S. (2014). Assessment of the actual sustainability of nuclear fission power. Renewable and Sustainable Energy Reviews 32: 16-28

Atomic power ⇔ sustainable development

Environmentally benign?	•**Reactors do not emit CO_2** •**Emissions of noble gases** •**Radioactivity, waste, accidental releases**
Non-exhaustible?	•**Breeder reactors failed** •**Eventual fusion beyond 2050**
Social responsible? **Global?** **Safe?**	•**Radioactivity; loss of habitats** •**Capital & technological intensive** •**Weapons proliferation (Israel, Pakistan)**
Low risk? **Prosperous?** **Affordable?**	•**Risks not insurable = not economic** •**Negative learning curve (increasing costs)** •**'Safe enough' is excessively expensive**
Democratic? **Participative?**	•**Rejected by risk-aware citizens** •**Technocratic decision-making**

Atomic power needs fuel-cycle and cooling source & sink activities



Whatever atomic process is invented for cooking water (e.g. fusion), the flabs make atomic power bad business, for entrepreneurs, investors, governments, ... mainly for the common people carrying the burdens of technocratic folies

Eliminate thermal power

Nuclear plant as 'should' (Walt Disney picture)

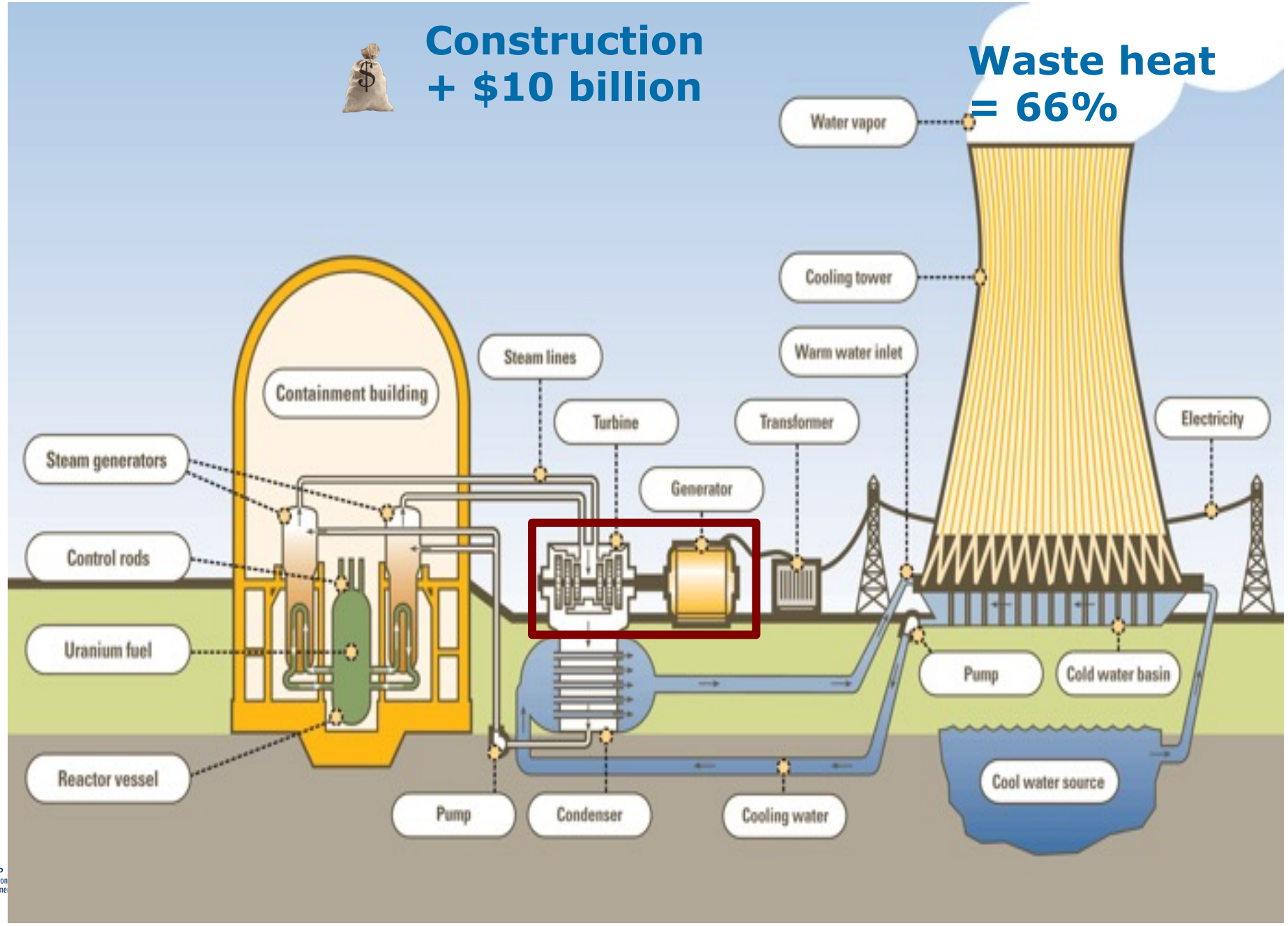


Illustration sink flab atomic power Fukushima Daiichi destroyed in March 2011

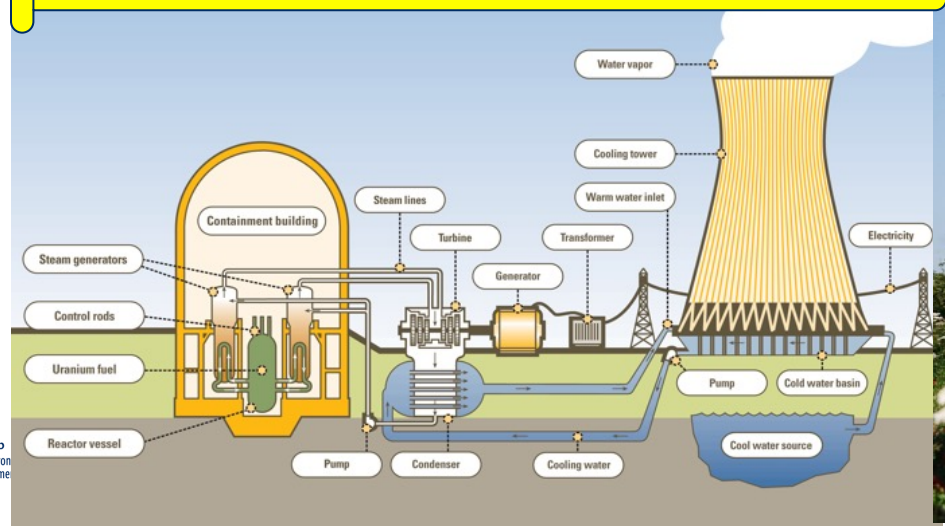
Technological reversals in electricity generation

18th – begin 21st century ⇔ **3rd millennium**

Thermal flows, costly & risky ⇔ **Harvesting ligth, wind, water**

From cumbersome techniques
on concentrated energy sources

To direct harvesting
of diffuse, variable flows



Atomic power: a death horse

Atomic power: World War-II fetish

- **Trailblazer of energy obesity since 1950s (slogan "*electricity too cheap to meter*")**
- ***1950-2000: ALL* means for developing & experimenting all nuclear technologies**
- **'Outcomes/Inputs' ratio is far smaller than 1, if not negative**
  - **Huge costs and risks, already in present GEN-III+ reactors**
  - **Technological failure of GEN-IV breeder, high temperature, small modular reactors, plutonium and thorium fuel cycles**

Persistent problems:

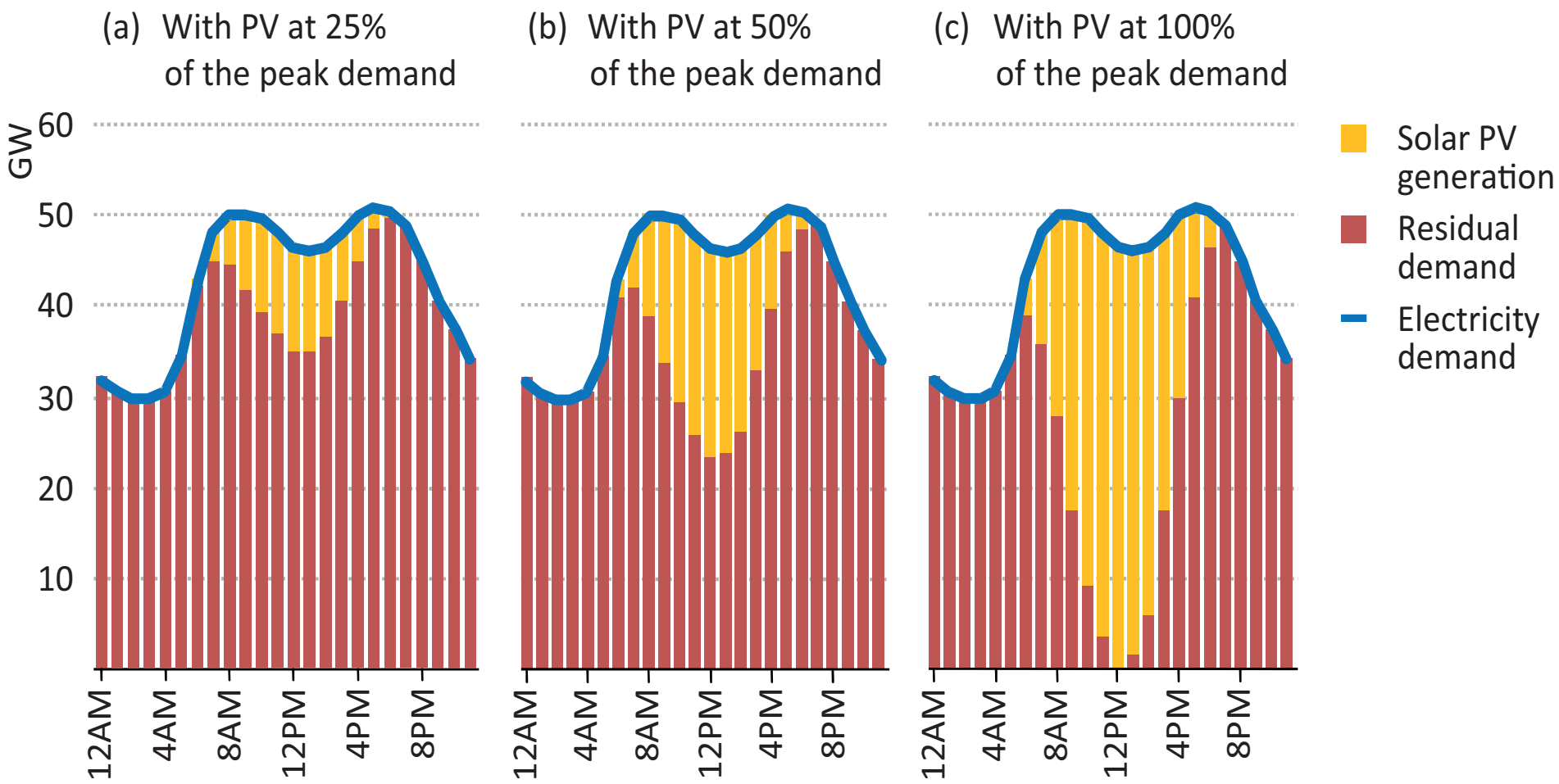
- **Fake 'Risks of *atomic power are negligible; people, behave rational: accept the risks*'**
  ⇔ global re-insurance companies refuse to insure the risks
- **IEA (International Energy Agency) states: Financial affordability requests 'giant power stations (1700 MW), several units on one site, series building' (like France did in 1980s)**
- **Atomic waste is a burden for all future generations; no country has viable solutions**
- **Illusion: GEN-V fusion (ITER demo-project: 10 million parts, expected building expense is now €34bn , no single electric kWh will be produced)**

Opposite to Sustainable Development

Atomic power conflicts with wind, solar, water flow power

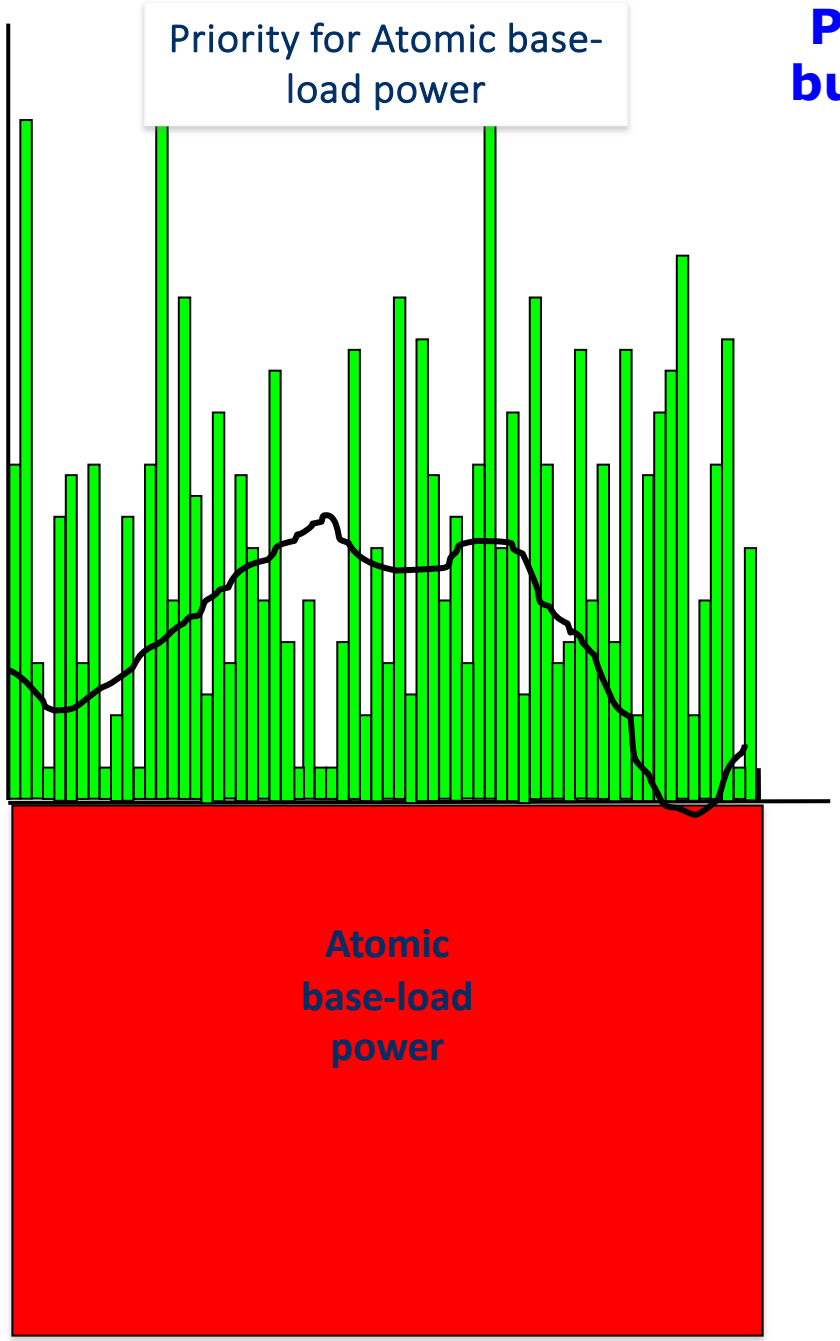
Competing for base-load supplies . PV without storage; no redundancy
Source: IEA Outlook 2013

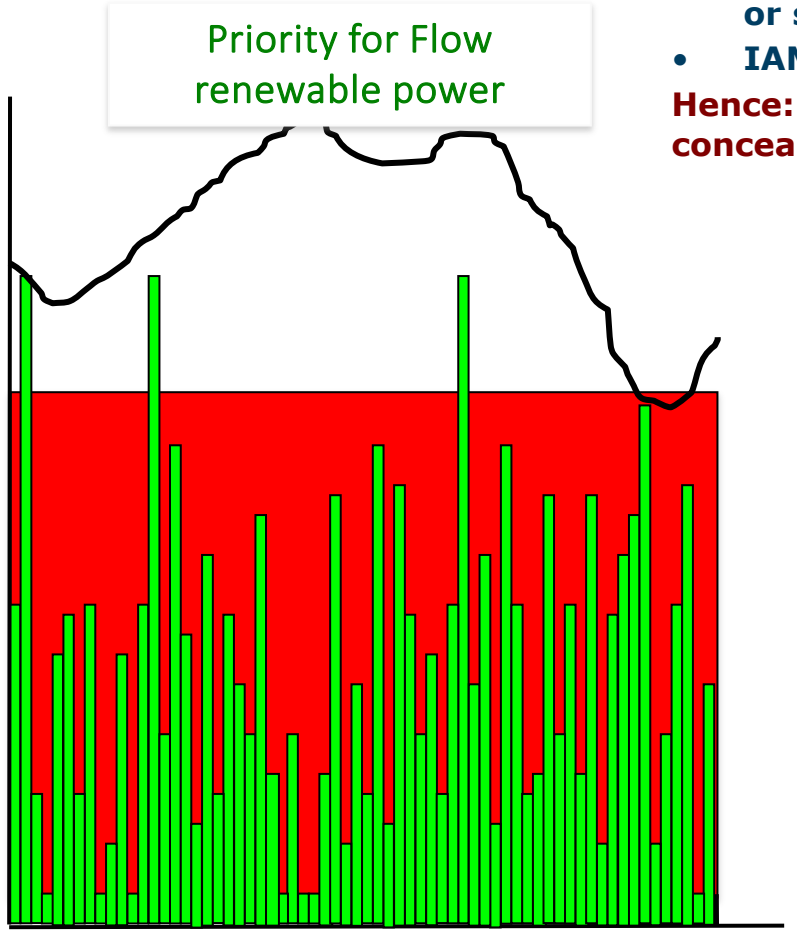
Figure 6.8 ▷ Indicative hourly electricity demand and residual electricity demand with expanding deployment of solar PV



Annex A

Priority for one ruins the business case of the other





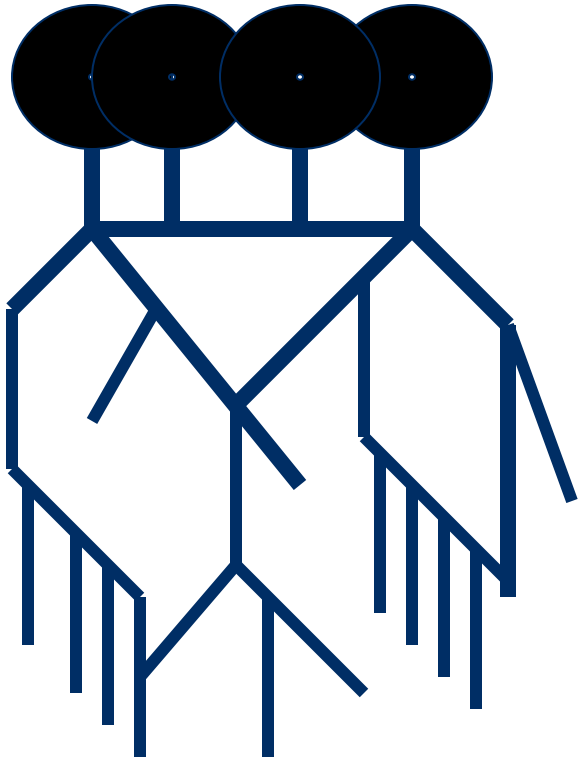
Integrated Assessment Models (IAM) are coarse

- **Electricity is a transient phenomenon**
- **RE and NP are both inflexible, but differently**
- **Each claims the first place in instantaneous merit-order rankings**
- **Electricity generation modeling needs hourly or shorter chronology**
- **IAMs juxtapose yearly volumes**

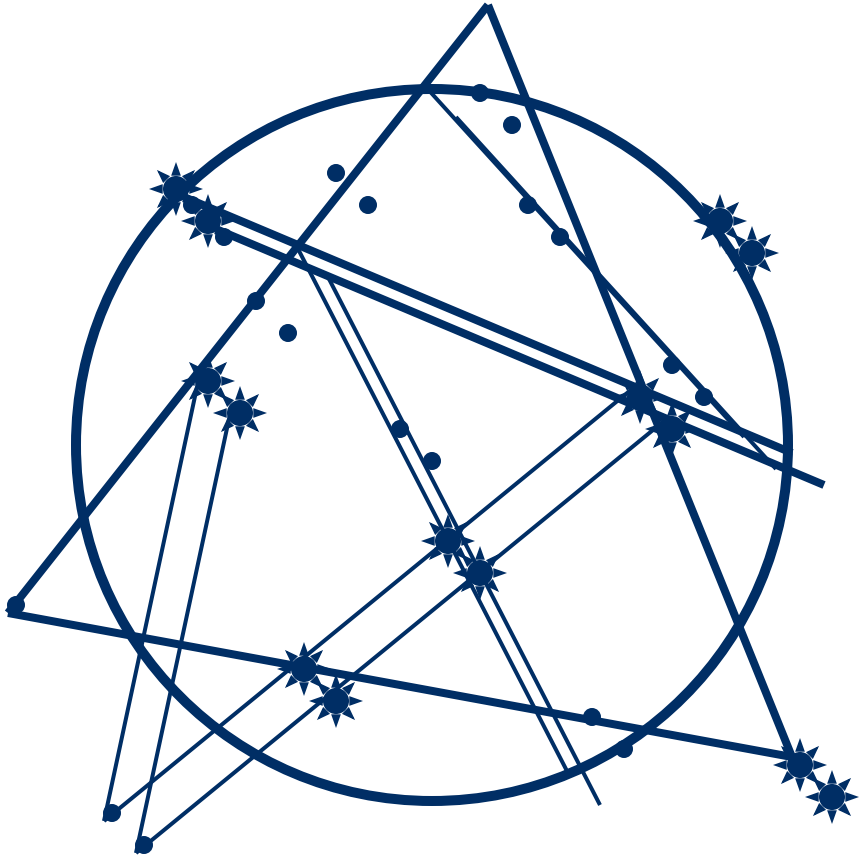
Hence: incompatibility flow RE / nuclear power is concealed by IAM models

Millions of prosumers request different grid developments

Pyramidal (incumbent grids)

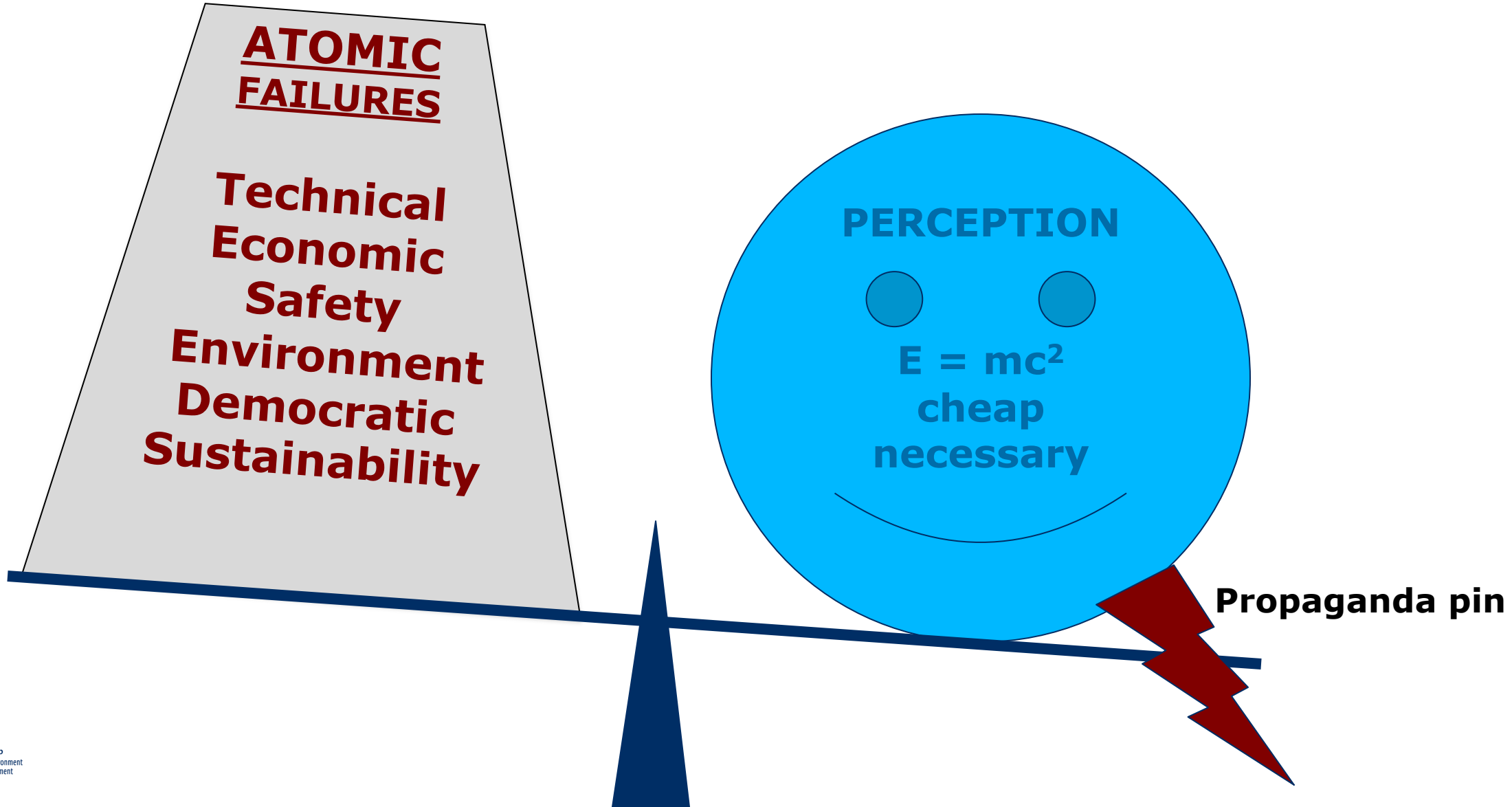


Multilateral (smart grids)



Phase out atoms

Nuclear support = Political Mystery



Brussels, July 2007: Nuclear Forum contracts Saatchi & Saatchi for creating a virtual reality discourse

1. **Confuse the minds**
   Nobody knows well: not we, not you, who could?
   No real case, so why we need independent experts?
   ***Anti* is stupid: how can you be anti when you don't know?**
   "*Pro or Anti*" is personal taste like football games or Pepsi/Coca; please, be tolerant!

2. **Flirt with renewable energy as 'matching partner'**
3. **Adopt modest slogan '*Nuclear power is not thé solution, but there is no solution without*'**
4. **Lime virtual support: *Pro* nuclear is who is not *explicitly* anti, i.e. The silent majority**

5. **Silence, eliminate opponents**
   No debate, no public forum
   Media control: advertising $, influencing journalists
6. **Obscure facts about nuclear failures, e.g. neo-modernists praise inanity as strength**
7. **Hide when Fukushima burns: after March 11 2011, Nuclear Forum left the public ether & theater until 2012**

Hide the facts, Create MediaMishMash

'Neutral' experts speak

- J. Hansen, Lovelock, Pinker, … knowledge about electricity systems, atomic power?
- Soft talk: 'success', 'hope', 'courage', 'no alternatives',…
- 'Radiation is not the problem, it's human fear'
- March 2011: Monbiot's pronuke opinion in the Guardian praised by media; critical replies by Leggett, Froggatt silenced

Grey is the color

- Kills understanding (the earth is flat and spheric)
- No learning progress (when + add – to obtain 0)
- No sustainability assessments
- Veiled interests orchestrated by IAEA, Euratom, NEA, although the industrial & financial decision-makers avoid nuclear investments

IAEA inflitration of global climate policy UNFCCC & IPCC

Atomic power is *financially bankrupt*.
Its life extension hangs on *lavish subsidies* by governments.
***Climate Change* is now the excuse for the looting.**
Like fossil fuel lobbyists, *IAEA sneaked* in the climate COPs & IPCC Working Group III

IAEA violates the *essential principles* of IPCC rules by precluding the *scientific assessment* of atomic power,

- **Skipping publications of independent scientists,**
- **Denying comments sent via the IPCC process rules,**
- **Bypassing sustainability standards,**
- **Disguising the incompatibility of atomic with sunlight and wind power**

Clearly: a huge IPCC *atom-climate gate* exists.
Surprisingly or not: the *press and NGOs remain silent*.

IAEA inflitration of global climate policy UNFCCC & IPCC

The secrecy protects the *fake atom discourse,* for example

1. **"*Renewables, Nuclear Power, Carbon Capture & Storage*" are proposed as equivalent options, while they are incompatible.**
   And, only Renewables can avoid climate collapse

2. **The talk is: "*People's concerns about nuclear safety impede nuclear expansion*", while real risks are huge, given all re-insurance companies refuse liability for atomic power**

Verify the statements by checking IPCC Working Group III reports of 2014, 2018 and 2022

More detailed information about IPCC and the influence of IAEA is available in ANNEX

Salient points to remember

- Atomic technology was developed to make atomic weapons. Atomic weapons remain the main goal of atomic technology.
- The neo-modernists' *Nuclear Now* dates back to the 1970s. The great financial efforts of those days have been bogged down in financial nightmares and catastrophic accidents.
- The promising atomic technologies have been all demonstrated, and all failed. There is no real element to assume things will be any different in the 2020-30s.
- IAEA is the spider in the web of atomic energy propaganda. The mantra *renewable energy, nuclear power, carbon capture & storage* as equivalent mitigation options is biased. IAEA infiltrated Working Group3 of the IPCC, and managed to suppress a scientific review of the literature on atomic power. This derogates from the essential mission of IPCC. The traditional media are blind to this *atom climate-gate*.
- In 2007 Saatchi & Saatchi conceived new atomic power propaganda for the Nuclear Forum, traditional media and neo-modernists. Belgium's energy minister of the green party speaks neo-modernist propaganda language on atomic power.
- Atomic power requires heavy source and sink flabs related to its fuel cycle and to the cooling water needs
- Atomic power is several times more expensive than electricity from sunlight and wind in commercial terms, and even more when social costs are considered.
- Private power companies refuse spending on atomic power, and try to pass on the eternal burdens of high-level radioactive waste to the public community.

ANNEX

IPCC = *Intergovernmental Panel* on Climate Change

www.ipcc.ch

United Nations embedded *intergovernmental panel*, established in 1988 by

- **WMO [World Meteorological Organisation], Geneva**
- **UNEP [UN Environmental Program], Nairobi**

To assess state of knowledge related to climate change
Periodically assess the published scientific, technical and socio-economic information on

1. **Climate change**
2. **Impacts with options for adaptation**
3. **Origin and evolution of GHG emissions + Policy options for mitigation**

- **Special interaction governments ⌘ scientific community**

The panel = mainly officials of government administrations (small countries include academics in the delegations when they lack informed officials)
The panel

- **Nominates members of the IPCC bureau**
- **Initiates new reports**
- **Reviews, adapts & adopts the Summary for Policy-Makers (SPM)**
- **Interacts with UNFCCC conferences of parties (the yearly COPs)**

ANNEX

The 3 Working Groups of IPCC

3 Working Groups (WG),

- **Each WG gets its own Bureau, appointed by the governments**
- **+ TSU (Technical Support Unit with ca. 10 administrative & scientific staff) sponsored by a (wealthy) country**
- **+ a Chairperson (mostly from the country paying the TSU) + two vice-chairs**

WG1	WG2	WG3
Greenhouse effect Climate change 99,9% of global know-how	**Impacts on bio, geo, water, air, …** ≈ 50% of know-how	**Drivers: people, activities, mitigation, response** < 25% of social sciences
Supervised by WMO + by all the meteorological centers of the nations + specialized units, like Tyndall in the UK	**Supervised by UNEP** + inputs by national research units on nature and environmental issues	**Supervised by ? not UNDP, nor other UN…** Impact of neoliberal interests neocon thinktanks, lobbyists, neoclassical economists

Task force on inventory methods

Measurement of Greenhouse Gas (GHG) emissions
Contentious, e.g. land-use, forestry, equivalence of other gases with CO_2
Countries are not obliged to inform about emissions of the military

IPCC reports
www.ipcc.ch

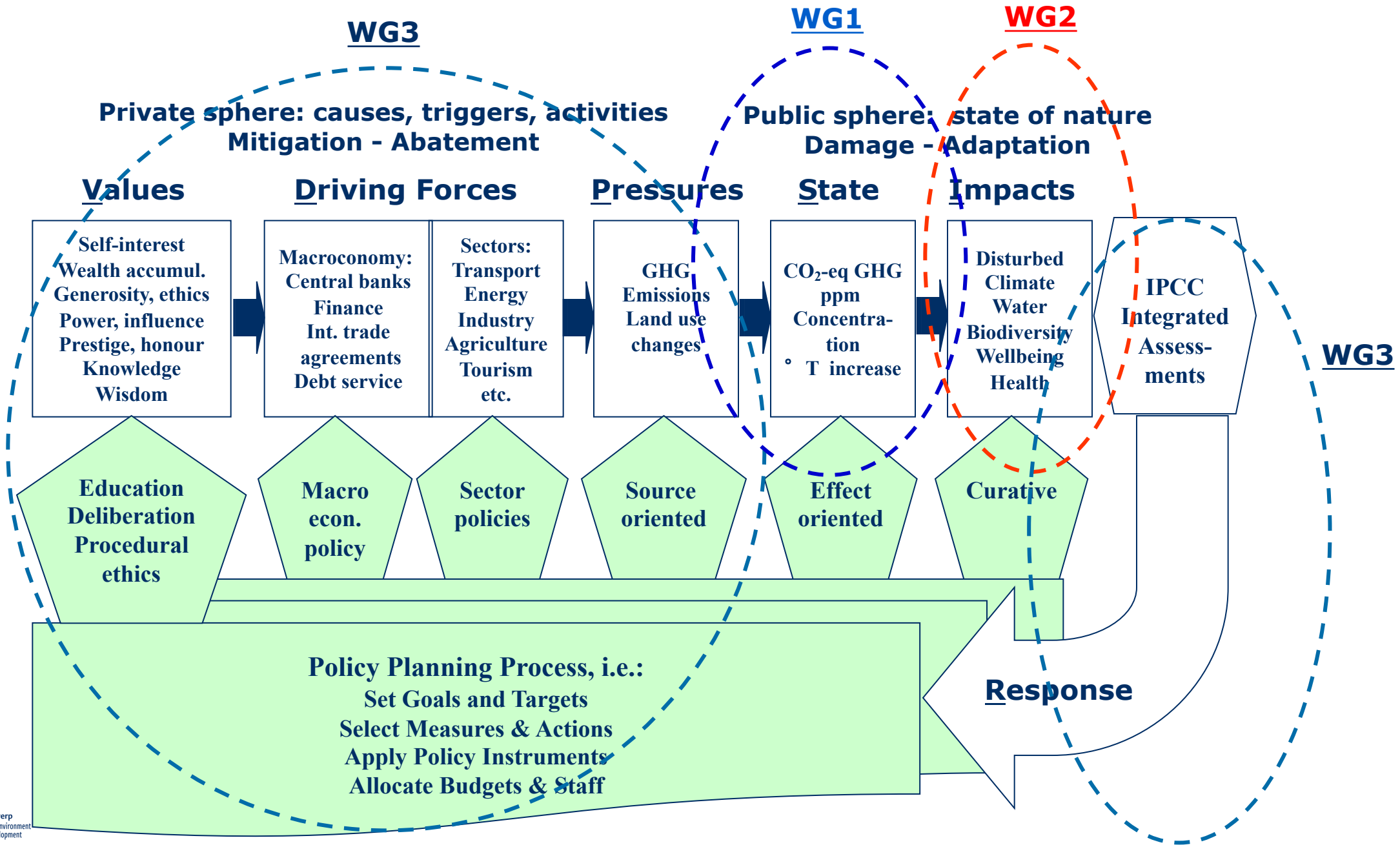
- **Assessment Reports (AR)**
  - Consists of 3 WG-Reports + Synthesis Report (SYR)
  - Published in 1990, 1996 SAR, 2001 TAR, 2007 AR4, 2014 AR5
  - Latest AR6 (2021-2023)

- **Special Reports (SR), e.g.:**
  - Carbon Capture & Storage (CCS)-2005
  - Renewable Energy & CC (SRREN)-2011
  - Extreme events-2012
  - Global Warming of 1.5 degree Celsius-2018
  - Climate Change and Land-2019
  - The Ocean and Cryosphere in a Changing Climate-2019

- **Every Assessment Report consists of**
  - Main Scientific reports of 3 WG: several chapters, technical summary, glossary, annex(es)
  - Summary for Policy-Makers (SPM): ca.25p., consensus during 1 week meeting, influenced by governments (some more than others) – most relevant for policy-making

ANNEX

IPCC 3 Working Groups cover various parts of the climate policy field



ANNEX

IPCC authors & editing
www.ipcc.ch

- **Who selects the authors?**
  - **Member governments propose national scientists, experts**
  - **The bureau evaluates candidates & selects chapter authors**
  - **For each chapter: 2 Coordinating Lead Authors (CLA), around 10 Lead Authors (LA), 2 Review Editors (RE)**
  - **Chapter CLA can adopt Contributing Authors, with notice to WG bureau**

- **How IPCC edits & finalizes WG or Special reports?**
  - **Panel scoping meeting adopts table of contents**
  - **TSU organizes four plenary meetings among authors**
  - **Review editors assist in meetings 3 & 4: control whether authors respond properly to comments by external reviewers**
  - **Two review rounds on draft reports: first for experts, second for experts + governments**
  - **TSU edits draft SPM and Technical Report**
  - **SPM approved in plenary panel meeting, during 1 week**

ANNEX

IPCC *Intergovernmental Panel* on Climate Change

- **Scientific coverage**
  - **Mainly peer-reviewed publications:**
    Literature up to date closure about 2 years before publication ⇔ recent science is relevant
  - **Wrestling with Sustainable Development paradigm: SD much named, not integrated**
  - **Representativeness:**
    - **WG1 (meteo, climate): almost full coverage (except deniers)**
    - **WG2 (impacts, adaptation): comprehensive, but not complete**
    - **WG3 (societal aspects, mitigation, policy options):**
      Dominance of Anglo-Saxon worldviews (neoliberalism) ⇔ actual world diversity
      Integrated Assessment Models (IAM): biased, poor representation of reality
      Neoclassical economics utopia prevails, like carbon markets and uniform pricing

- **Pro**
  - **Amazing quantity of free information, science and results**
  - **High relevance, however with the caveat: WG1 >> WG2 >>>> WG3**
  - **Significant influence on awareness of citizens, politicians, …**

- **Con**
  - **Limited to assessing available science ⇔ disruptive thinking**
  - **No policy recommendations: not-being 'policy prescriptive'= incumbent dominances & inequalities are not challenged**
  - **Significant influence of governments on author selections and on SPM: danger of mediocre results in policy views (WG3)**

ANNEX

IAEA *International* Atomic Energy *Agency*

An intergovernmental organisation

- Founded in 1957, headquarter in Vienna
- €668 million budget in 2022
- Double task: Promotion + Control atomic technology = unseemly combination

IAEA infiltration in climate policy

- IPCC via contributing authorship for the texts about atomic power
- UNFCCC via official presence at COP meetings, by art. 16§8 of the Paris agreement (2015)

IAEA in IPCC (exemplary case AR4 WG3 in 2014)

- H.-H. Rogner, retired IAEA staff, then at IIASA (International Institute for Applied System Analysis) in Laxenburg near Vienna was '*Contributing author*' for the sections on atomic power

In the report's approval plenary meeting (Berlin, April 2014), the proposed draft text was '*Nuclear power expansion is limited by barriers of public concern about safety*'. This framing implies that not the nuclear risks are the problem, but adverse public opinion.

Omitted is the position of the big global Reinsuring companies (Swiss Re, Munich Re, etc.) rejecting the liabilities of full indemnity contracts of nuclear accidents.

When discussing this in full plenary, contributing author Rogner took over the meeting's chair (far beyond good IPCC practice)

ANNEX

IAEA *activities in IPCC*

IAEA pursues two diverging goals:

a) Absolutely preclude a true scientific description of the actual state of atomic power

b) Upheld the triptych *Renewable Energy, Nuclear Power, Carbon Capture & Storage, or 'RE,NP, CCS'*

For goal a) the IAEA installed contributing author

- **Selects mainly publications of IAEA, NEA (Nuclear Energy Agency, OECD), IEA**
- **Next publications of authors favoring nuclear power**
- **A few known critical authors are cited faulty, such as A. Grübler, M. Schneider**
- **Peer reviewed literature of independent academics are negated**
- **Comments of critical reviewers are negated**

The effects of IAEA's disguise are obvious in AR4(2014), SR1.5(2018), AR5(2022).

The disguise conflicts with the Principles Governing IPCC Work, Section 4.3.3

"clearly identify disparate views
for which there is significant scientific or technical support,
together with the relevant arguments"

Goal b) needs continuous repeating of the mantra 'RE, NP, CCS'

- **The juxtaposition spreads the biased idea of 'equivalent' options**
- **RE and NP being conflicting is veiled (also by the poor Integrated Assessment Models)**
- **The faulty mantra is deeply penetrated, and too little criticized**