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REGIONAL CONFERENCE

INCLUSIVE ENERGY TRANSITION IN SOUTH ASIA AND BEYOND

7–9 MAY 2024 • Galle, Sri Lanka



Day 2 Session 3 - DEVELOPING THE WORKFORCE FOR ENERGY TRANSITION

PLEASE INTERRUPT ME, I PREFER THE DIALOGUE



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The Future of Work & the Energy Transition

Assumption: Towards net zero GHG with economic prosperity*

1. Energy Transition: What it is (my pov). The Scale and its Urgency. Work force lens.
2. Energy Work Force: Current & Trends
3. Work Force Transformation Management

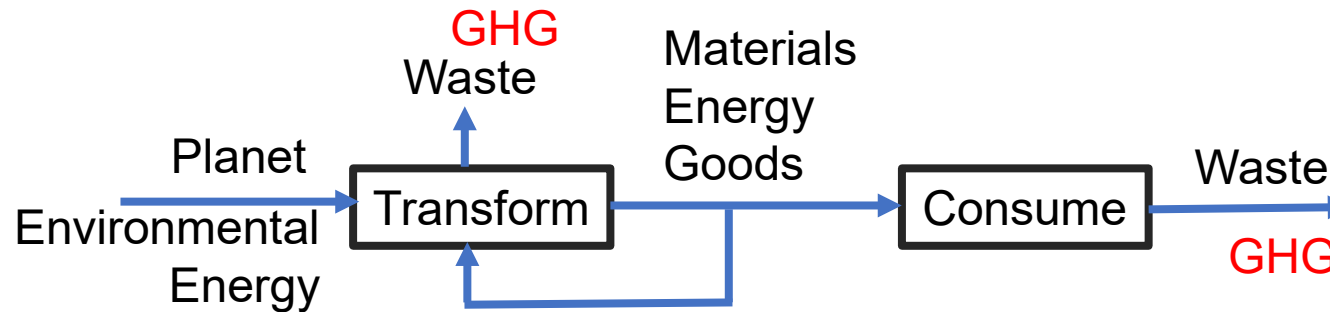
* e.g. 10% of the world population has no access to electricity



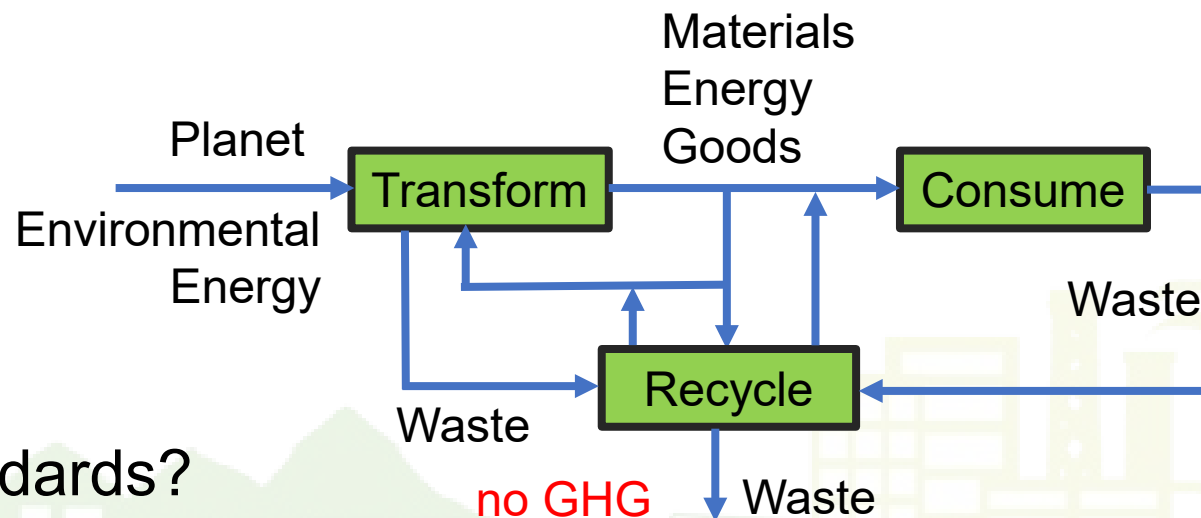
What is this “energy” transformation about?

**Total
Redesign
to Reduce
Consumptive
Use of Available
Environmental
Resources,
Eliminating
Fossil Fuels**

Maintain living standards?
Equity? Access? Fairness?
Wealth redistribution?



**Infrastructure
(Investment)**



**Food & waste is responsible for 30% of the GHG
Energy is responsible for 70% of the GHG**

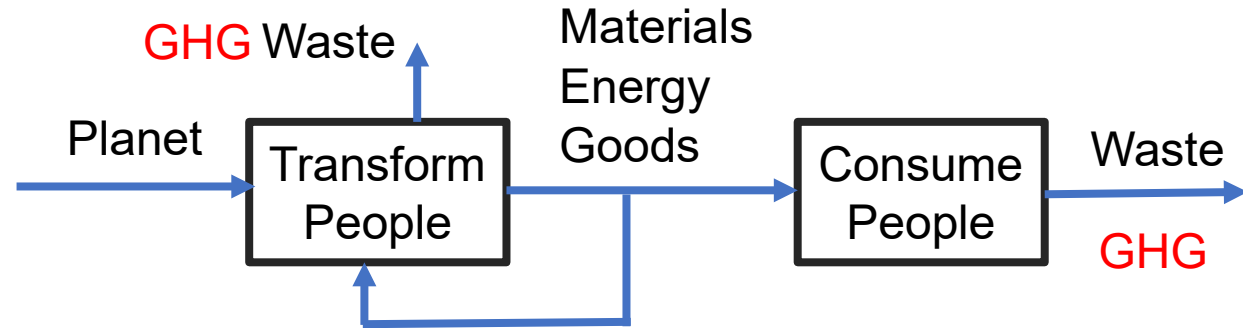
What is this “work in energy” transformation about?

BAU complexity at world scale

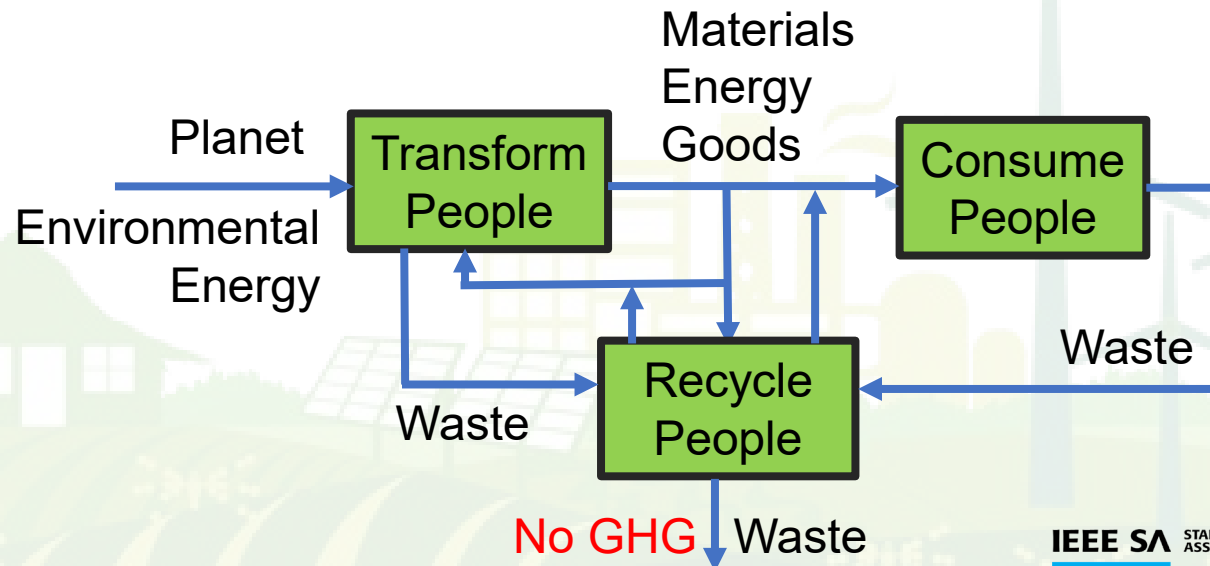
- up-skilling
- re-skilling
- retiring jobs
- creating new jobs
- productivity gains
- massive infrastructure transient (re-inventing BAU)

BUT added complexity by

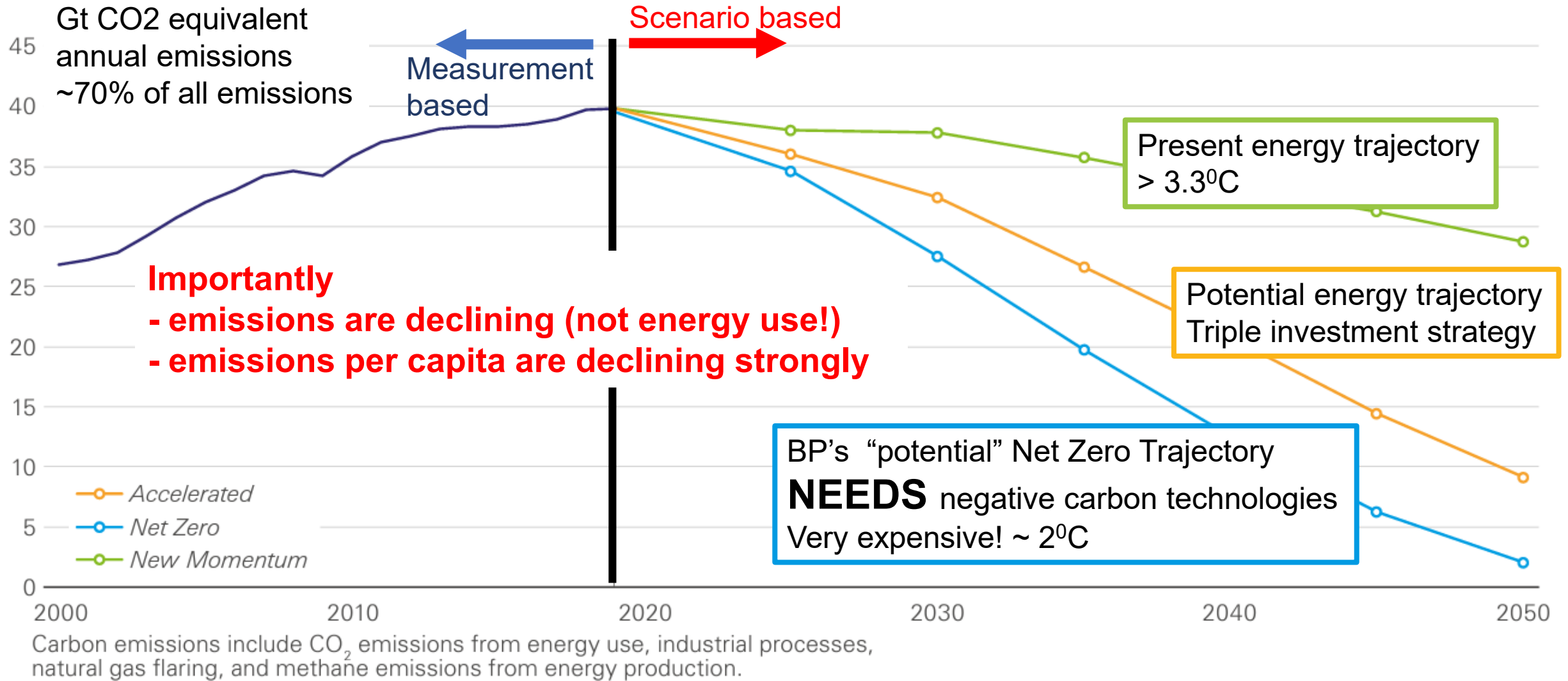
- population transients
- digital industrial revolution
- AI impact
- climate change (adaptation)
- geo-political transients



ALSO Transforming people's skills, experience, understanding



BP Energy Outlook 2023 – The Urgency for Action (see also IEA)



But not agriculture, nor waste (30%), not accounting for fugitive

Energy Transition?

1. Low hanging fruit (~50% of global emissions, or 70% of energy emissions, orange line, accelerated)

- 30% efficiency improvement (low hanging fruit, systems design), includes heating and cooling using heat pump technology & geothermal, demand management
- convergence of transport and electricity sectors

Needs a (~5 fold?) significant expansion of electrical infrastructure (more if only hydro, wind, solar & storage are used, i.e. not nuclear) & digital twin technology.

2. Difficult (~20% of global emissions, last 30% of energy emissions, blue line, Net Zero)

- Fibre & molecules: using bio-fuels and direct bio-synthesis
- Industrial & high grade heat: bio-fuels, hydrogen, concentrated solar
- Air transport using bio-fuels or hydrogen

3. Very difficult (~30% of global emissions, not discussed)

Food & natural fibre (25% of global emissions, 44% of habitable land use, 70% of fresh water use & scarily on a trajectory to double in size)

Waste accounts for 5% of global emissions

4. Fugitive emissions & global warming associated emissions (unaccounted emissions)



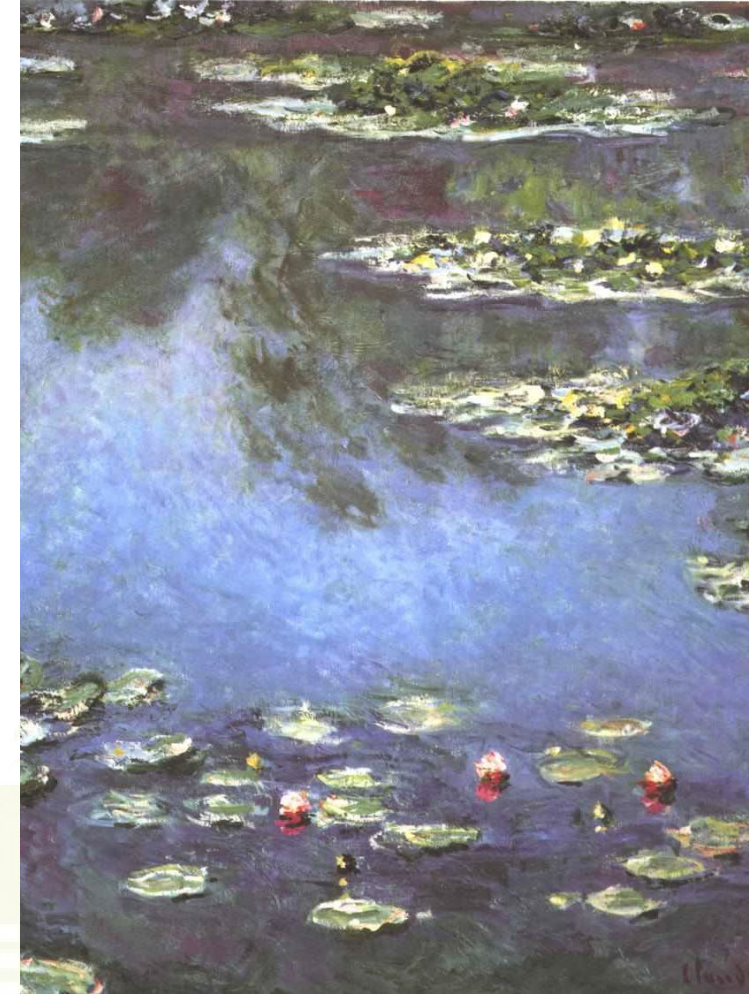
Is the energy outlook pessimistic in its estimates?

2024 survey of executives in energy and natural resources

- 1/3 say net zero by 2050 is achievable, 2/3 say no! (1/3 by 2060, 1/3 not before 2070)
- Apart from efficiency gains, the **return on investment** is obscure; *net zero hurts the bottom line*
- Most did the low hanging fruit; what remains is hard
- **Compliance** and reporting is difficult, burdensome
- **AI** (generative AI) will play a significant role

<https://www.bain.com/insights/reality-check-energy-and-natural-resources-executive-pulse-2024>

the Bain & Company, March 2024, pulse check



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Present Energy Work Force (IEA, 2023 report, 2022 numbers)

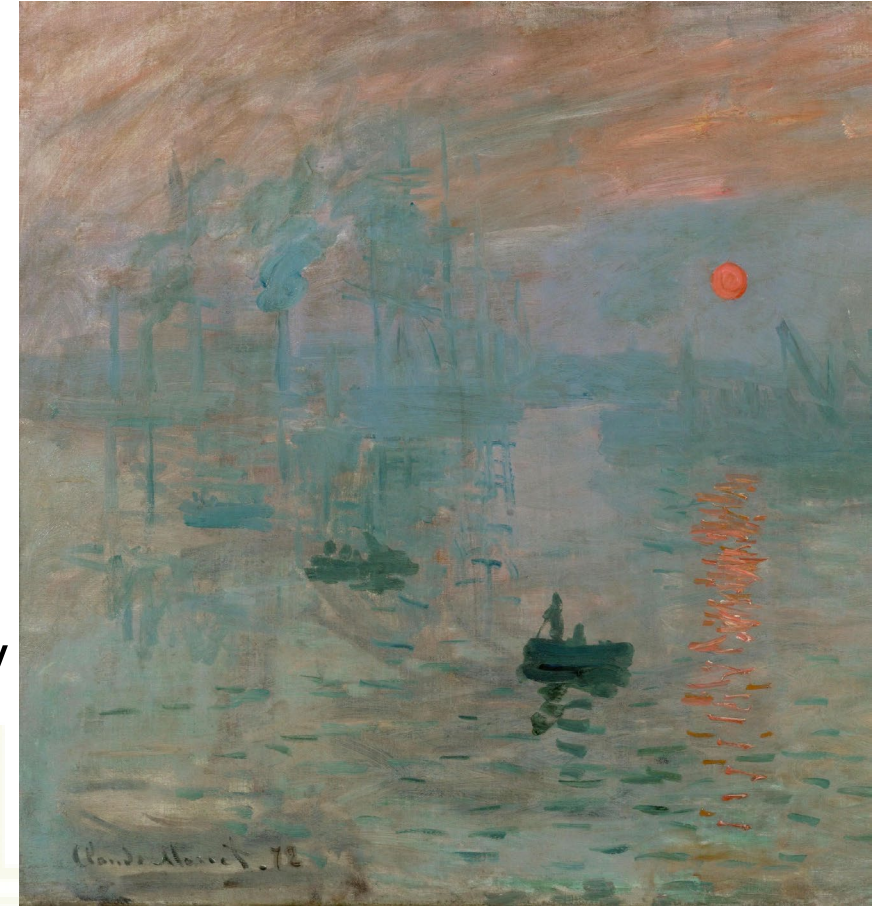
67M workers (3% of world employment)

Evenly split between fossil fuel based & clean energy

Only 16% or 11M are women (in line with global STEM trained workforce).

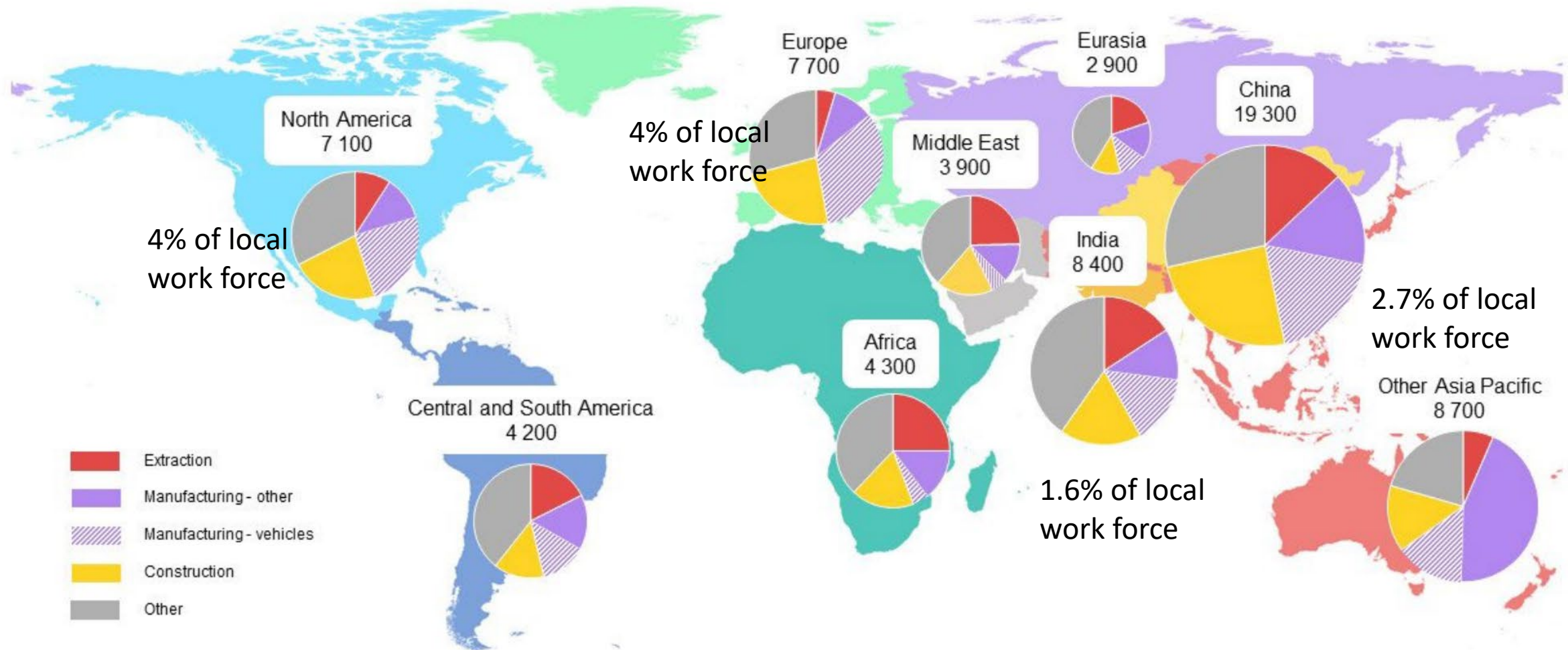
Energy sector includes all mining & manufacturing relevant to energy and the use of energy (like engines, turbines, transformers, cables, inverters, solar panels, wind turbines etc...) *Difficulties in classifying, makes reading reports hard!*

Clean energy (hydro, nuclear, renewables) <20% of all energy use. 21M or 60% of the clean energy jobs are in manufacturing (batteries, inverters ...7M), and installing & construction 14M. **Decommissioning is absent?**



Asia hosts the world's largest energy workforce owing to its substantial population, lower labour costs, brisk investment and sizable clean energy manufacturing sectors

Energy employment by economic activity and by region, 2022 (thousand workers) ~67,000 world



Generation, transmission, distribution (20M), efficiency (10M)

Electrical Energy Work Force (IEA, 2023 report)

20M workers in electrical power (2022)

12M in generation (~2M in renewables,
~9.6M in fossil and ~0.4M in nuclear)

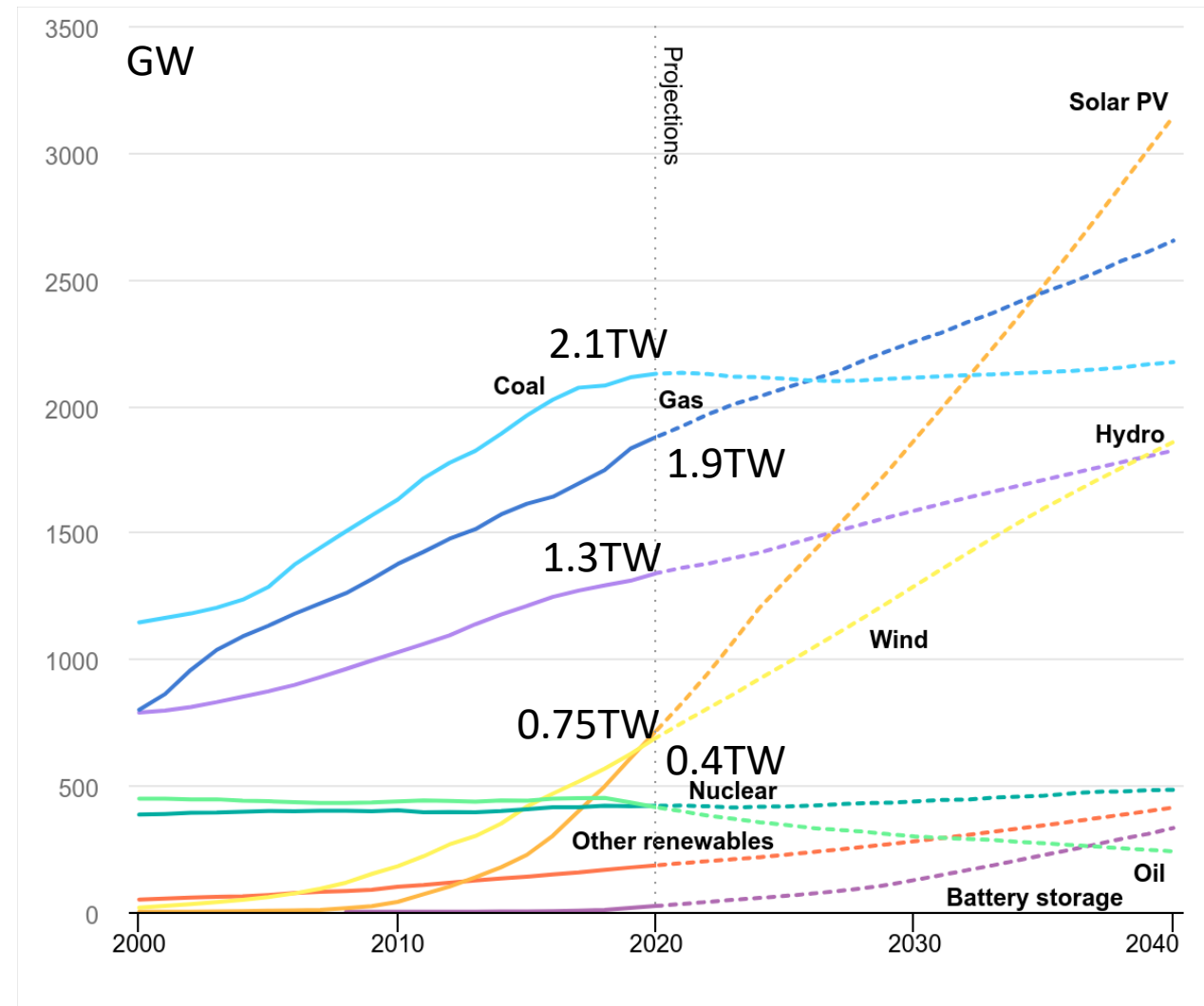
8M (transmission, distribution)

9TW to grow to 15TW by 2050

“current scenario” expect 32M workers by
2050 +8M in transmission & distribution;
+4M in renewables, no decline in fossil, (no
global displacement, only local)

Net Zero Scenario has **27M workers** +8M in
transmission & distribution; -9M in fossil; +8M
in renewables; (global and local displacement)

BUT 15TW is not enough, only -21% GHG



IEA, *Installed power generation capacity by source in the Stated Policies Scenario, 2000-2040, Paris (2019 data)*

Present Scenario Difficulties

Present Energy Scenario:

1. From 9TW electricity in 2022 to 15TW in 2050:
access (+10%) and population growth (+30%),
and 10% to 30% of the electrification of transport
(depending on realised efficiency gains).
2. No (real) job losses in fossil dependent energy!
4M extra in clean electricity production (6TW extra)
11M extra in clean energy construction (transient jobs!)
8M extra in transmission & distribution
23M extra workers but only 12M in new steady state

**BUT all of this, only reduces global emissions in 2050
by ~21% compared to 2022 (present energy trajectory).**



What are some of the problems in work transformation?

Optionality (too many voices, too many choices)

- “local” uncertainty about technology path
- uncertainty in training provision (*exceptions* welders & electricians & project management)
- local optimality is not global, and vice versa
- present technology choice is not future proof
- BUT no action implies higher climate risk

Energy supply must be ...
sustainable, affordable,
reliable, resilient, equitable,
accessible, transparent

These represent societal choices,
with cost & investment and global
implications

Digital Twin & AI (for productivity)

- essential for reporting / situational awareness
- efficiency, demand management
- more digital skills required (short supply)
- more cyber security risk
- more STEM skills
- more displaced work(ers) (productivity gain)

Resilience

- Getting harder (climate change)
- New grid as a collective of micro-grids (*déjà vu*)
- “Hard” easily drives costs up
- Guarantee access to essential services (health, disability)?

What are some of the problems in work transformation?

Social licence to operate

(requires public at large education)

Requires a no conflict of interest party

Regional vs metropolitan differences

e.g. STEM attainment; renewable access; resilience; climate impact; training access

Fossil fuel jobs strongly **localised**, but renewable energy jobs are dispersed and often under remote management

Strong(er) STEM dependency but AI also forces greater emotional intelligence and mental stress (cognitive load up).
How to address the gender balance?

Mapping existing skills and aptitudes in obsolete fossil fuel industries with “reasonable effort” pathways to new job skills (all in flux) & create the training
Who is responsible? Employer? Employee?
Government subsidies?
Education providers dilemma?

National & international standardisation of required skills
Licensing / certification
The swamp of micro-credentials
Industry vs educational certification

Some actions we are taking in Australia to navigate the mess

In Victoria Regional / Metropolitan Career & Skills Networks

Participants: councils, industry, education providers

Partially supported through State & Fed Government

A forum to share trends, needs, opportunities, ideas

Focus on educating Small to Medium Enterprises, next work force

A new 2024 National compact for higher education

Equity & affordability

Inclusion (first nations focus)

Pathway diversification (higher apprenticeships)

Collaboration

Flexible pathways (high school, vocational, higher education)

A nationally maintained “skills and expertise” index & language

Using AI, using digital platforms

How do people, employers and employees express their skills, expertise?

How do the experts express skills, expertise?

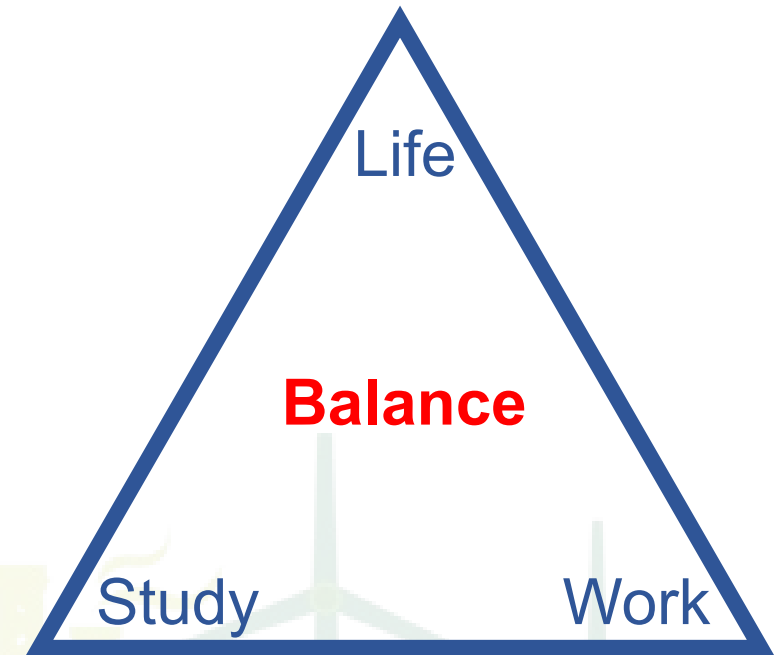
Any (large) government infrastructure project includes a training opportunity (students, interns, ...), and needs real community outreach



Some actions we are taking in Fed Uni to navigate the mess

Co-op education: education by society, for society, *with society*

- **ease transitions** life is not linear; all study pathways: high school, vocational, and higher education, reskilling, upskilling, industry credentials; learning in life and at work are important; how do we recognize ALL skills, expertise, understanding
- **balance study & career/work & life is life-long**; balance is in constant flux (e.g. AI induced shifts in the nature and productivity of work are large)
- **STEM focus with emotional intelligence & well being**
- **Particular emphases** (my remit) AI (IT + business transformation), energy transition, circular economy, sustainability



Some References I found Useful

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9. Paintings by Claude Monet, via Wikipedia, public domain

Thank you

