

Accelerating a 'win-win' global energy transition

Theory of Change for implementation

Implementing systems transition by consensus-building among broad coalition. → *Resulting in energy security, resilient business, & meeting 2 °C Paris target with cheap energy worldwide.*

A theory of change in development by a think tank network
100+ professionals from energy, finance, sustainability, politics,
& interdisciplinary academia

Summary

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- **Ember** - energy think tank – data analysis

Developed by:



Featuring support from:



Est. reading time: 5-15 minutes



Purpose, Information & Contents

Purpose of this initiative:

- Build consensus on implementation of shared pathway & interconnected efforts for international energy transition
- Grow broad coalition of decision-makers and experts, catalyzed by TAFF coalition at Santa Marta conference in Colombia, April 2026.
- Co-creation project, continuous optimization

Who we are:

- Informal, open think tank network of professionals across sectors including energy, finance, academia, sustainability, and public policy
- Coordinated by former United Nations employees (United Future) with multiple partner organizations

Envisaged Outcome of Implementation:

Meet 2.0 °C target of Paris Agreement + substantial progress on SDGs 7, 9, 13, 14, 15, and 17 before 2040

Request:

30-minute conversation for feedback on common theory for implementation with public & private coalition

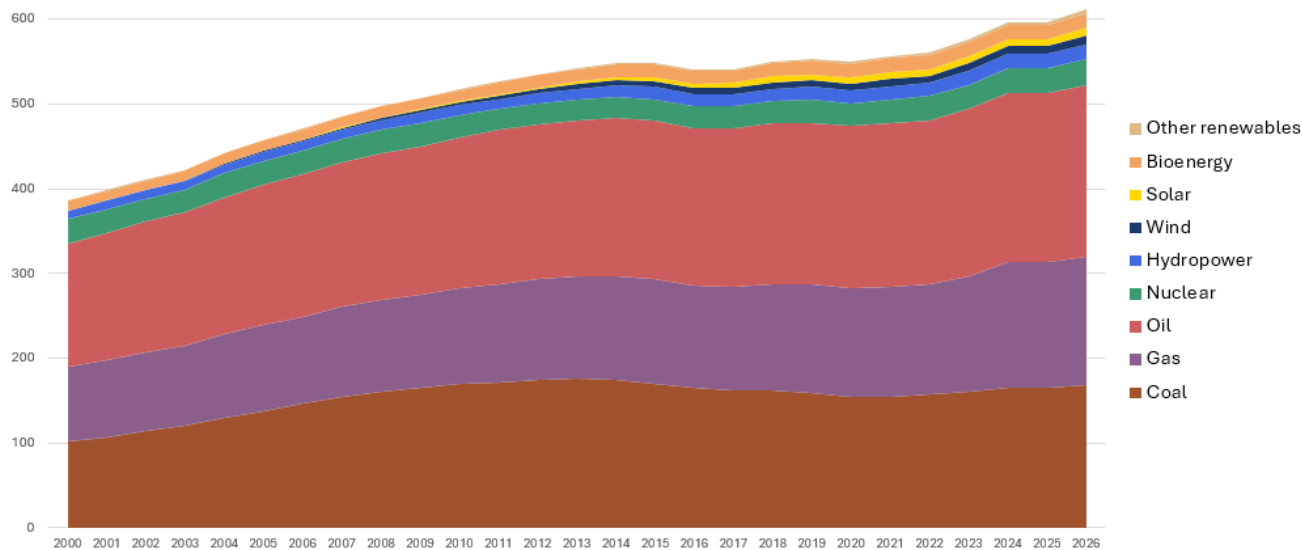
Contents:

- | | |
|---|--------------------|
| 1. Analysis | <i>Slide 3-7</i> |
| <i>Climate & Energy in 2026</i> | |
| 2. Theory of Change | |
| Step 1: Innovation Accelerators | <i>Slide 8-16</i> |
| Step 2: Intra-transitions | <i>Slide 17-20</i> |
| Step 3: Feedback Loop & S-Curve | <i>Slide 21-22</i> |
| Step 4: Signals & Coalition | <i>Slide 23-24</i> |
| 3. How to contribute & Contact | <i>Slide 25-27</i> |

The global energy transition is not progressing fast enough to meet Paris Agreement's targets, though there is potential for acceleration

Primary energy production by source, World

Measured in exajoules (EJ). Includes all end uses: transport, heat, industry & electricity.



Data source: Energy Institute Statistical Review of World Energy (2025)

Sources: * (IEA, 2026; Ember (Walter et al., 2024) **(UNEP, 2025; Our World in Data, 2024 *** (Bradley, 2025; Kerry, 2025)

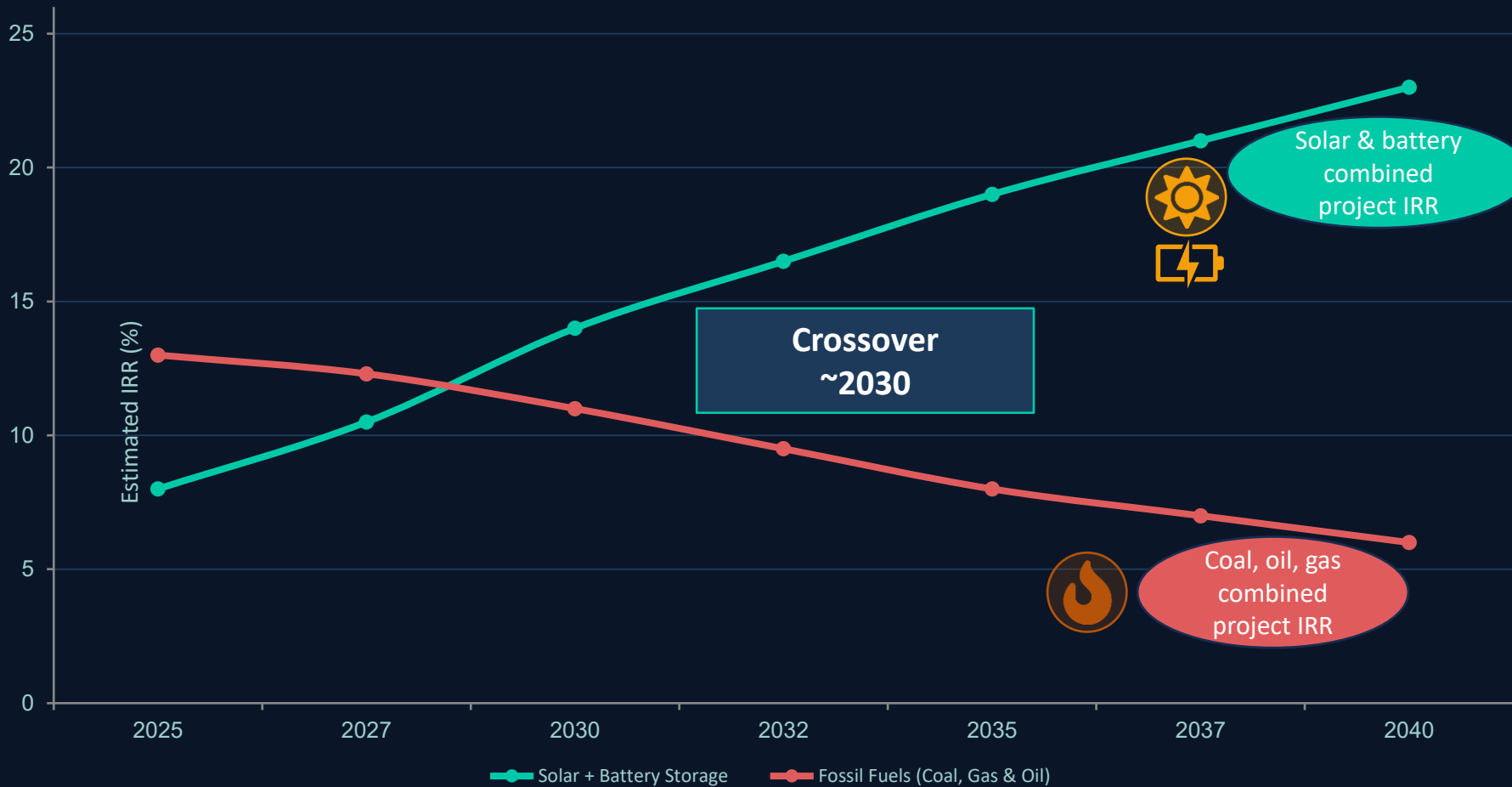
1. Global emissions must decline by ~35% by 2035 for Paris Agreement's 2 °C pathway and ~55% for 1.5 °C pathway, compared to 2025 (currently on track for 2.8 °C warming)**.
2. Fossil fuels still account for ~80% of global energy supply. Renewables remain largely **additive** (adding new) rather than **substitutive** (replacing old) in global energy mix. This is largely **driven by fossil energy companies' business strategy**
3. Carbon removal (direct air capture) solutions are significantly underperforming and widely considered insufficient to close emissions gap within required timelines***.
4. Driven by rapid cost declines in **solar** and **battery** technologies, **new "Electrotech" solutions** are proving a **far more efficient** and **cheaper** technology than fossil fuels* (see Appendix 1). **Global investment in clean energy overtook investment in fossil fuels in 2025*** (see Appendix 1).
5. This opens pathway for **depolarized** and **depoliticized** energy transition, similarly to **Montreal Protocol**. **Santa Marta TAFF conference 2026** offered unique opportunity to begin implementing alternative pathway. This Theory of Change was developed to implement this best-case scenario.

Solar + Battery Will Outcompete Fossil Fuels on Returns by 2030

Our
analysis



Estimated project-level IRR* (%) — Solar + Battery Storage (combined) vs. Fossil Fuels (coal, gas, oil combined)



91%

of new renewable projects
cheaper than any fossil fuel
alternative



\$1.42 / 100km



China electric car



\$3.65 / 100km



Norway electric car



\$11.20 / 100km



USA gasoline car

⚠ IRR projections are illustrative estimates based on current cost trajectories and IEA/IRENA/BloombergNEF/Ember scenarios.

* Actual returns vary significantly by geography, policy regime and project structure.

Sources: IRENA Renewable Power Generation Costs 2024 (Jul 2025) · Ember Global Electricity Review 2025 & Battery Storage Analysis (Dec 2025) · IEA World Energy Outlook 2025 · BloombergNEF Energy Storage Cost Survey 2025 · IISD / Carbon Tracker | **realities may vary across different markets, geographies*

3 scenarios for international fossil fuel phase-out

We can go
here if we
take right
action



++ Win-win: a Just Transition for All

*Accelerated infrastructure upscaling, cost reduction, and **intra-transitions** of energy companies make business and socio-economic cases for transition clearer, igniting a self-reinforcing feedback loop of global transition, where everyone wins.*

Win-win co-benefits:

- + Lower energy prices
- + More clean jobs long-term
- + Energy independence
- + Fewer microplastics
- + Less air pollution

Reduced timescale



We are
here



+ - Win-lose: Competition of Renewables vs. Fossil fuels

Fossil fuel companies worldwide continue to lobby inside governments against policies supporting transitions towards electrotech. Meanwhile, solar & battery prices decrease, the competitive edge grows and publicly funded infrastructure slowly shifts towards renewables. A temporary overshoot of climate targets is likely, with significant socio-economic consequences.

Increased timescale



-- Lose-lose: Fatal delays in the transition

A combination of worldwide aggressive lobbying by fossil fuel companies and geopolitical developments delays public support needed to shift infrastructure towards grid electrification. Climate tipping points are triggered, people & planet face crisis escalation & ecosystems collapse.

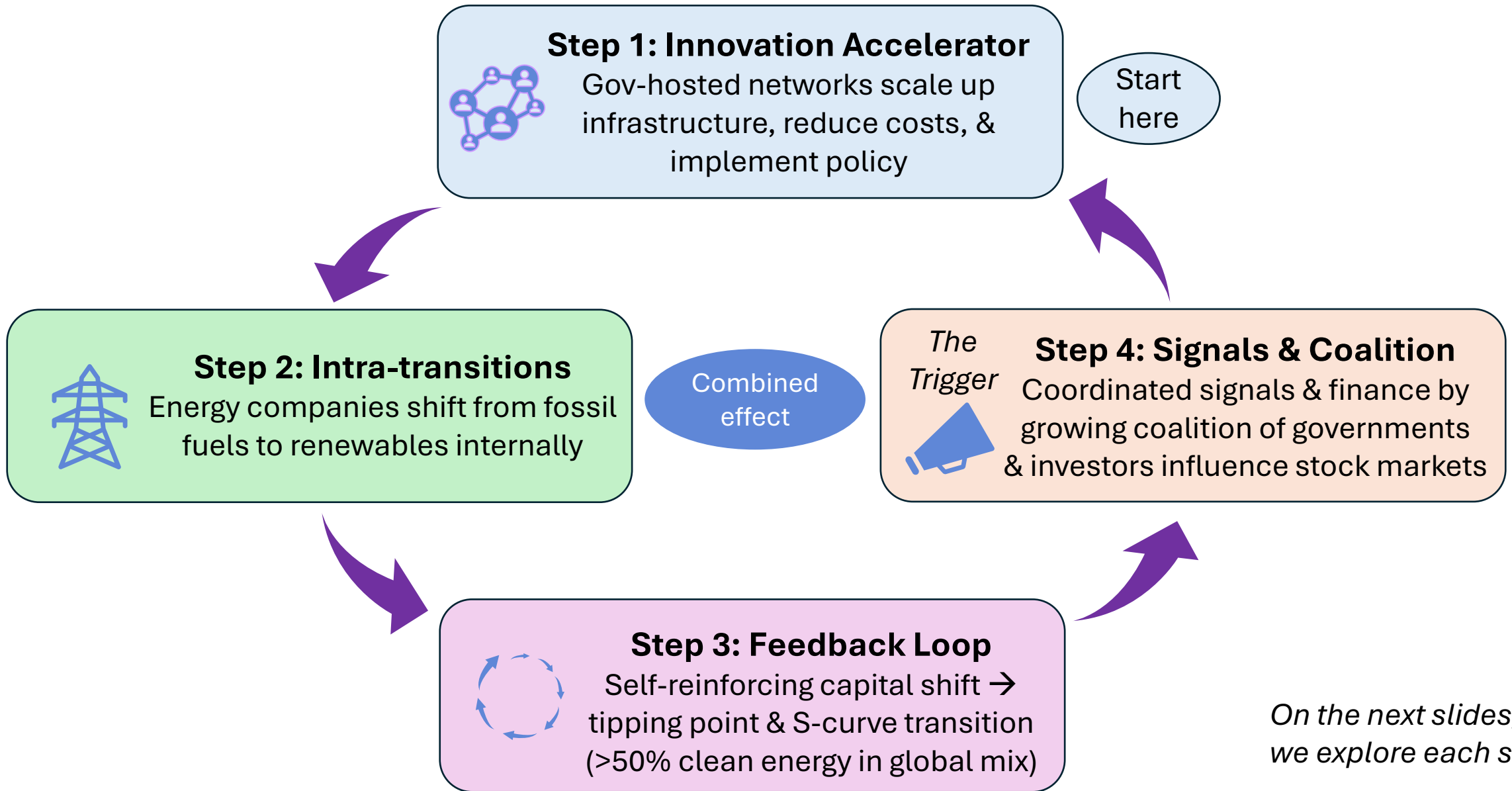
Question

How can we **clear systemic blockers** and **accelerate** the **international energy transition** towards a **tipping point of >50% clean energy** in **global energy mix**, with **benefit to all**?

In short, how do we realize this win-win-for-all scenario?

- ++ Climate
- ++ Nature
- ++ Economies & National Interests
- ++ People working in fossil fuel industry
- ++ People working in mining
- ++ Indigenous communities
- ++ Businesses & Consumers
- ++ Conservative voters
- ++ Progressive voters

Simple 4-Step Answer: Theory of Change



*On the next slides,
we explore each step*

What is an Innovation Accelerator?



Innovation Accelerator =

- “A low-cost, open **cooperative network** across many countries, **hosted by governments**, in which companies, governments, universities, and non-profits collaborate based on **win-win** logic (positive-sum), through a shared governance framework, accelerating an innovative transition by **reducing costs, scaling up technology for infrastructure**, and **cascading policy instruments**.”
- This network guides long-term structural change, exchanging communications and **knowledge*** in a **precompetitive space** (e.g. with reduced NDAs)
- This network **optimizes efficiency** in upscaling innovations of similar solutions across all members with a shared mission and **innovation culture**, accessing **pooled funding** from a broad coalition of funders.”
- For theory on how the **knowledge exchange** can be structured, see Appendix.
- For theory on role of **fossil-exporting countries**, see Appendix.

Sources:

- Mokyr, 2016; Aghion & Howitt, 1992 (Nobel Prize winners 2025)
- Loorbach & Verbong, 2012
- Elzinga et al., 2023

Examples include:

1. SEMATECH

Semiconductor research (1987-2005): Massive PPP (Public-Private Partnership) in semiconductor technology combining universities, governments & businesses.

2. ITER

Nuclear fusion (2013-2034): Broad funding coalition for International Thermonuclear Experimental Reactor.

3. Human Genome Project

DNA research (1990-2003): Massive funding coalition in bio-research combining universities, public and private sectors in 7 countries.

(4. COVAX (2020-2022)

COVID-19 Vaccine finance accelerator)

Innovation Accelerator:

Upscaling technology for universal benefit

Membership

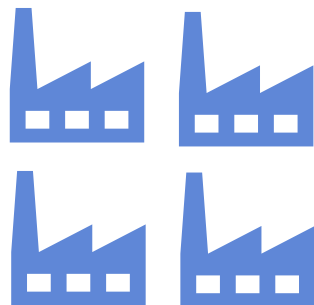
Governments

Hosted by governments of multiple countries, supports de-risking



Businesses

Cooperate on development & upscaling of new tech and contribute R&D Budget



Universities & non-profits

Contribute knowledge, research & development



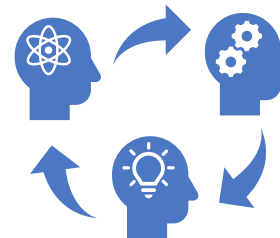
Financial Institutions

*(public & private)
Supporting investment in debt and equity*



3-fold benefit

1. Knowledge Exchange
with optimized efficiency



2. Patents: pooling & licensing
patents made available to all

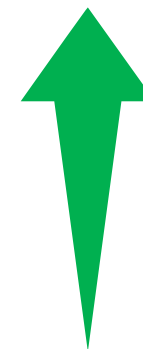
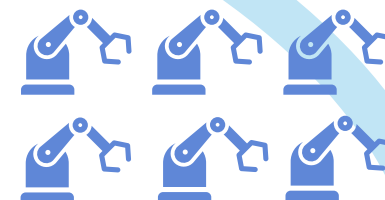


3. Pooled funding & VCs
upscaling new tech



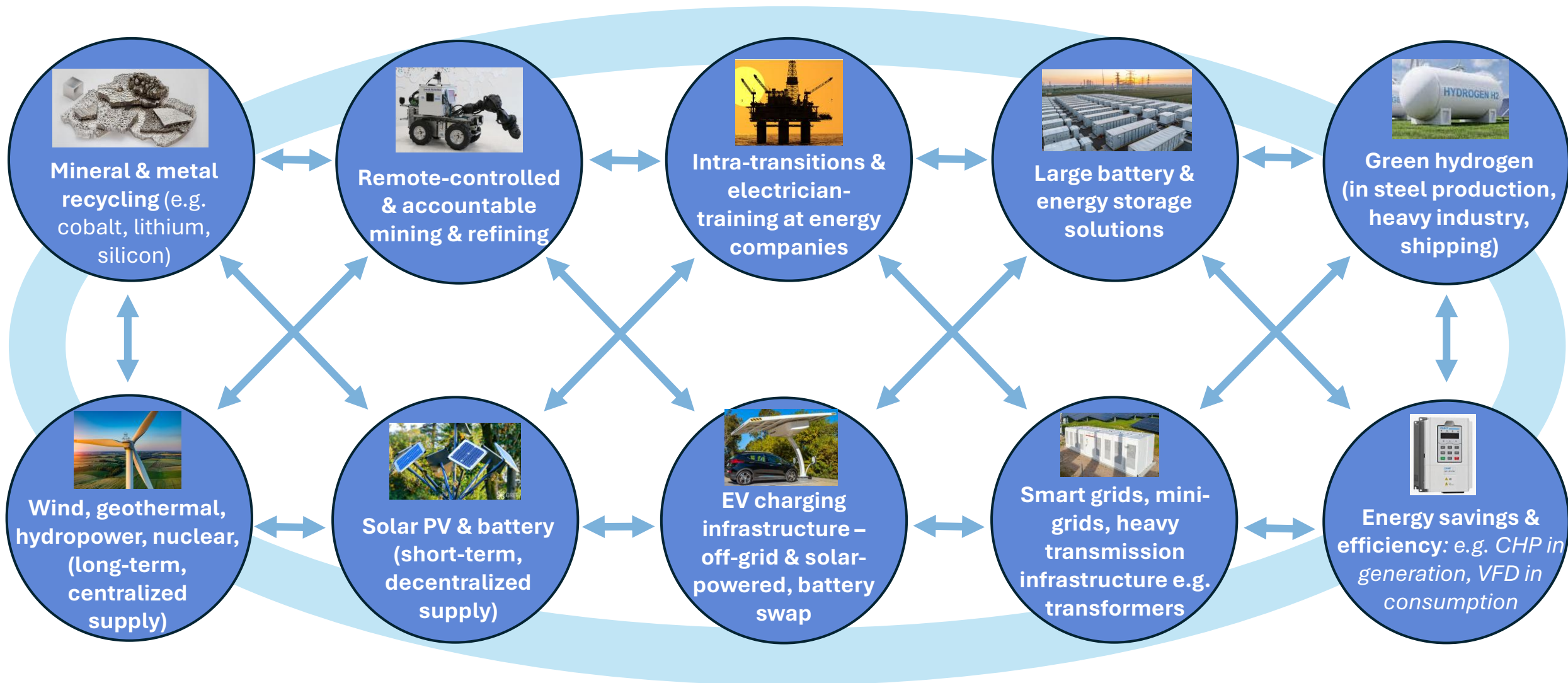
Result

*Tech upscaled,
cost reduced*



Circular Energy Systems: the path is clear.

Ten examples of technology solutions that an Innovation Accelerator can include to upscale circular new energy systems (most are already operational across the globe)*



**See Appendix 3 for 240 case studies*

Circular Energy Systems, with closed, circular supply chains, can be constructed worldwide – bringing energy security to all

Remote-controlled & accountable mining & refining provides first minerals & metals
(i.a. lithium, cobalt, silicon)



Remote-controlled & accountable mining & refining



Solar PV & battery:
short-term, decentralized supply

After 20-30 year lifespan, **up to 90%** of minerals are recycled & reusable in some installations*



Large battery & energy storage solutions



Mineral & metal recycling (e.g. cobalt, lithium, silicon)



EV charging infrastructure
(off-grid, solar-powered)

→
Results:

New Energy Systems:

- + • **Geopolitics:** Provide more **energy autonomy** & self-reliance (less reliance on imports)
- + • **Price:** Much cheaper than fossil energy
- + • **Climate:** >95% less heat-trapping gas emissions than FF
- + • **Circular**
- + • **Renewable**
- + • **Decentralized:** more community-ownable
- + • **People:** accountable
- + • **Nature:** accountable

*For case studies, see Appendix

Intra-transitions by multi-billion dollar energy companies have been done successfully

Intra-transition =

Processes internal to energy companies to transition from producing & selling mostly (>60%) fossil fuels, towards mostly (>60%) clean renewables (solar, wind, and battery)*

*For more factors driving internal transitions of energy companies, see full version ft. Employees for our Future
*For energy transition in China, see full version

Company 'first wave'	Country	Ann. Rev. USD 2024	% Renewables now	Started intra-transition	Total Duration	Type	Listed?
Ørsted	Denmark	~\$9.5 Bln	2019 85% renewables	2008 – 85% fossil fuels	11 years (21 yrs ahead)	Upstream (generation)	Listed & ~50% state-owned
Iberdrola	Spain	~\$64 Bln	2025 80% renewables	2005 ~70% fossil fuels	20 years	Integrated (up & downstream)	Listed
NextEra	USA	~\$25 Bln	2025 ~62% renewables	2002 ~60% fossil fuels	23 years	Integrated (up & downstream)	Listed
ERG	Italy	~\$2.5 Bln	2023 >90% renewables	2008 > 90% fossil fuels	15 years	Upstream (generation)	Listed
EDP	Portugal	~\$17 Bln	2024 >90% renewables	2007 > 80% fossil fuels	17 years	Integrated (up & downstream)	Listed

Key Insights from Ørsted can be used by other companies

- Ørsted's intra-transition was result of **internal decision**, driven by:
 1. **Growth strategy**
 2. ETS price
 3. Understanding of climate science in C-Suite
 4. Pressure from stakeholders & shareholders
 5. Government support
- Transition funding came **largely from internal revenue streams***
- Staff's **skillsets** from fossil tech were easy to **re-apply** in **offshore wind** → large share of offshore oil & gas staff now works in offshore wind projects
- Re-training for electrician work was manageable part of greater transition
- Ørsted collaborated with other local offshore wind projects to learn and drive down costs
- **Market reward 2016-2021:** after its 2016 IPO, Ørsted's shares roughly **tripled**, at one point most valuable power company in Europe by market capitalization → transition rewarded. Profitable, growing, high performance in indices & financial press. Post-2021 downturn due to external shocks & 1 market

*See Appendix 4

With knowledge
contributions from:

Ørsted



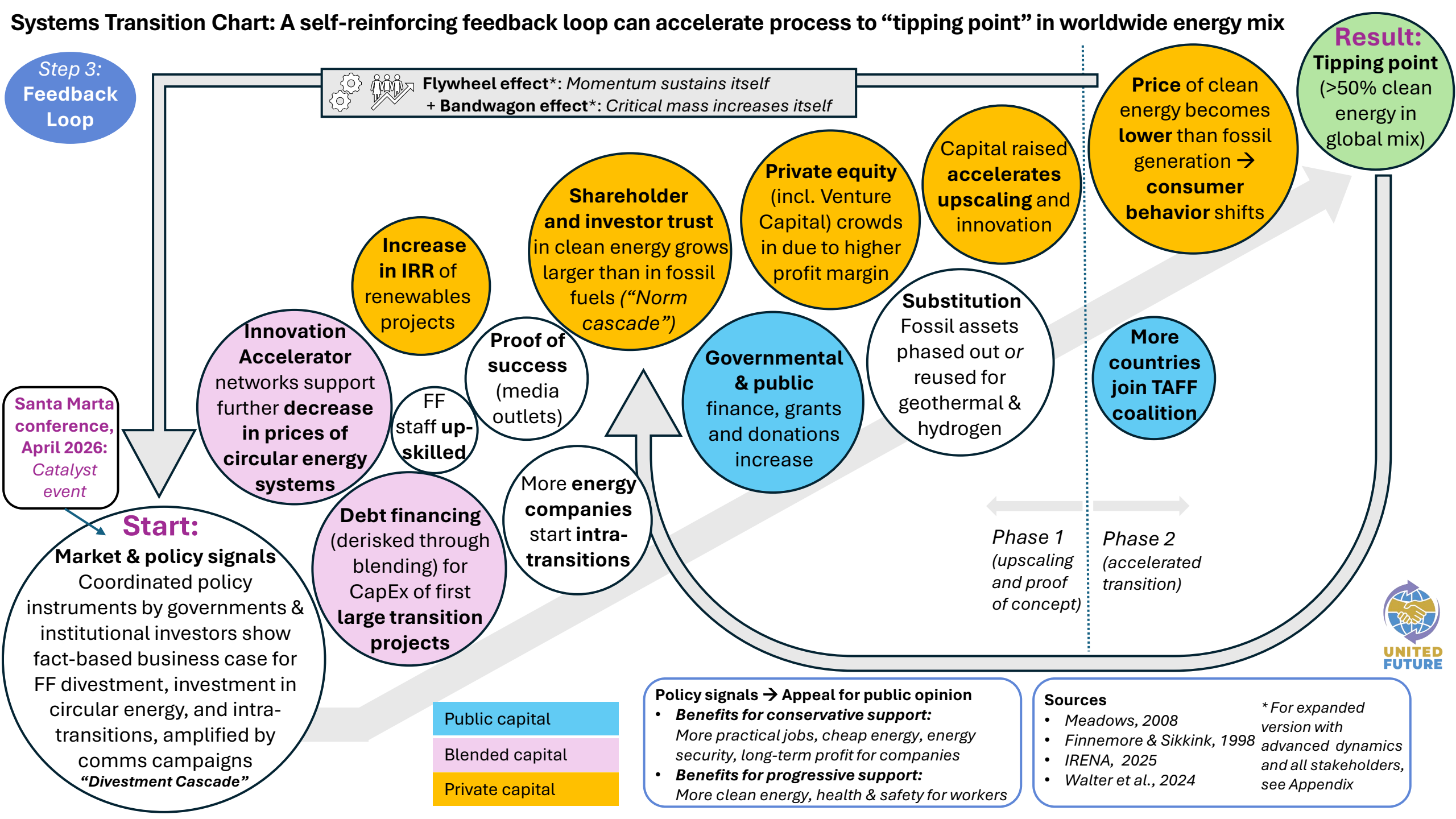
Energy companies internationally can combine multiple options for infrastructure of intra-transitions



Multiple, combinable options for intra-transitions include:

1. Diversification to **solar & battery** (part of **Iberdrola** strategy)
2. Diversification to **wind & battery** (part of **Ørsted** and **Iberdrola** strategy)
3. Diversification to **green hydrogen**
4. Diversification to **geothermal**
5. Diversification to **energy trading**
6. Diversification to **refinery** technology in hard-to-abate and hard-to-electrify sectors (e.g. **bio-energy & biofuels** for aviation or shipping)
7. Diversification to energy **grid & storage infrastructure** (Downstream)

Systems Transition Chart: A self-reinforcing feedback loop can accelerate process to “tipping point” in worldwide energy mix



S-Curve: path to cheaper energy systems, on track for 2.0 °C Paris target

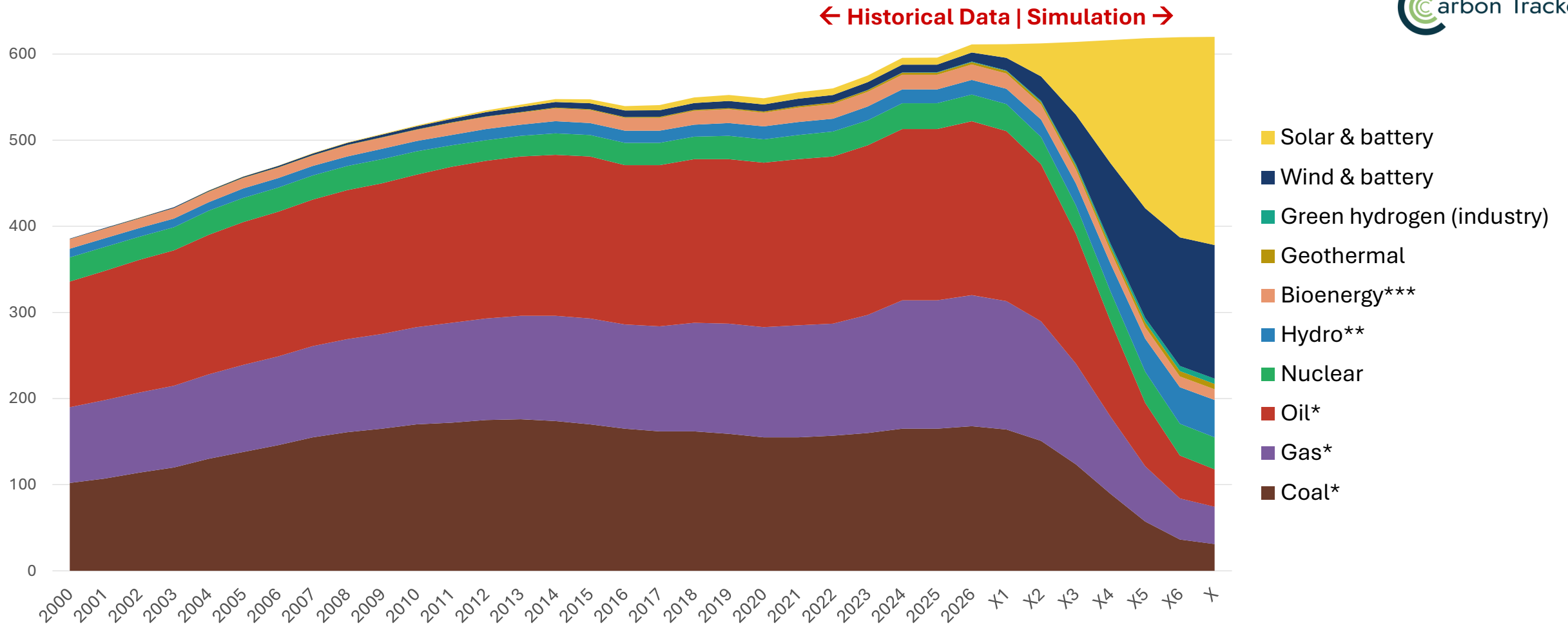
Example feedback loop result (simulation). Intra-transitions of energy companies → replacement of FF in global energy mix



Primary energy production by source, World: Simulation

Measured in exajoules (EJ). Includes all end uses: transport, heat, industry & electricity.

With data support from:



* With point source carbon capture where possible ** With eco-friendly systems for river wildlife *** Excluding wood-burning

Mobilizing capital at scale to accelerate a win-win energy transition

How the feedback loop transition process can be financed

N.B.: more granular approach to financing approach is currently in development (July 2026)
– please reach out to energy@unitedfuture.earth to join conversation

Phase 1 (Upscaling and proof of concept)

Shared public funding agenda for innovation accelerators

Participating governments align priorities across existing national, EU, and multilateral funds, with focus on full set of solutions to include in the Innovation Accelerators.

Additional private and public finance for innovation accelerators

Private R&D funds of energy & electricity companies + new public funds are deployed for the development of the Innovation Accelerators.

Blended finance for initial intra-transitions

Public and multilateral financial institutions (e.g. World Bank, EIB, etc.) provide concessional finance, guarantees, and other instruments to derisk private capital and support the first transitions.

Phase 2 (Accelerated transition)

Private capital mobilisation at scale for follow-up intra-transitions

Once proof of concept is achieved, major private investment institutions with patient capital (e.g., pension funds) provide equity and debt financing to multiple energy companies for the transition

Public-private partnerships for decommissioning

PPPs manage repurposing parts of fossil fuel infrastructure and other fossil fuel assets

Public capital

Private capital

Blended capital

Future Energy Systems & Post-Fossil World



Conclusion: we can accelerate an international energy transition and create win-win benefit for all

- ++ Climate:** At 60% renewables in global energy mix, IPCC projects we are on track for meeting 2 °C Paris target
- ++ Nature:** Less air pollution; less pollution from mining; intra-transitions can decrease scale of plastic production
- ++ Economies & National Interests:** Decentralized, cheap, & stable-priced energy systems, control of supply
- ++ People working in fossil fuel industry:** Continued long-term job security
- ++ People working in mining:** Better safety and human rights conditions
- ++ Indigenous communities:** Recycling and responsible mining reduces extraction from indigenous lands
- ++ Businesses & Consumers:** Cheaper & more stable energy prices – long-term financial stability for energy
- ++ Conservative voters:** Energy and transport is cheap and prices remain stable
- ++ Progressive voters:** Climate crisis is stabilized; pressure on nature is reduced

Action to implement in 2026

- Top-4 short-term policy recommendations
- *for governments in TAFF coalition*

1. Establish permanent cooperative network, hosted by governments (Innovation Accelerator)



Coordinate permanent network, hosted by governments, to **upscale and reduce costs of alternative circular energy systems**, as counterweight to OPEC. E.g. “Organization of Renewable Energy-oriented Countries (OREC)” – connecting existing initiatives. Companies & non-profits can become members.

2. Facilitate upscaling of new energy systems within cooperative network (Innovation Accelerator)



Within this new network, governments and non-profits begin to set up **efficient communications** among all companies and non-profits producing circular, alternative energy systems, in **pre-competitive space** to facilitate optimal exchange of data for trial & error in upscaling (low-cost). Additionally, begin to create pooled funding for (1) **patents** and (2) **venture catalysts** for under-scaled technological solutions, to further reduce prices of alternative energy systems. This can include e.g. recycling infrastructure for batteries, lithium & cobalt.

3. Divestment Cascade



Year-round, governments & institutional investors **publish coordinated series of detailed plans to divest from fossil fuels and invest in alternative energy sources**, sending signals to **capital markets** and stock exchanges, **disrupting investor & shareholders trust** in fossil fuels.

4. Intra-transitions of energy companies



For governments of countries hosting fossil fuel companies: raise financial pressure on fossil fuel companies to accelerate intra-transitions, citing proof of success from Iberdrola and Ørsted, and IRR risk for shareholders post-2030. **Work with boards & employees of fossil fuel companies to change decision-making from within, following a structured approach.** Provide **electrician training programs for fossil fuel staff**. Raise pressure to decommission or transform old fossil fuel assets, rather than selling them to other companies for continued use.

At low cost, actors in public and private sectors can help energy mix of >50% renewables arrive earlier *- possibly several years earlier than on current trajectory*

Possible contributions by:



→ Governments in TAFF coalition

Join co-development of plan for Innovation Accelerators, to reduce costs and upscale solutions i.a. **mineral & metal recycling, remote-controlled mining, EV charging stations, and cable & smart grid infrastructure**
→ completing decentralized & circular new energy systems internationally



→ Policy-makers

Coordinate cascade of policy instruments and divestment plans, sending signals to capital markets to divest from fossil fuels, and invest in renewables



→ Institutional investors

Publish detailed **divestment plans** to divest from fossil fuels and invest in renewables, because of rising IRR of solar & battery



→ Experts in i.a. **energy, finance, economics, academia**
Provide feedback on this theory of change



If we act on this shared theory now, chances to **avoid worst-case climate tipping points**, are increased, with benefit to all

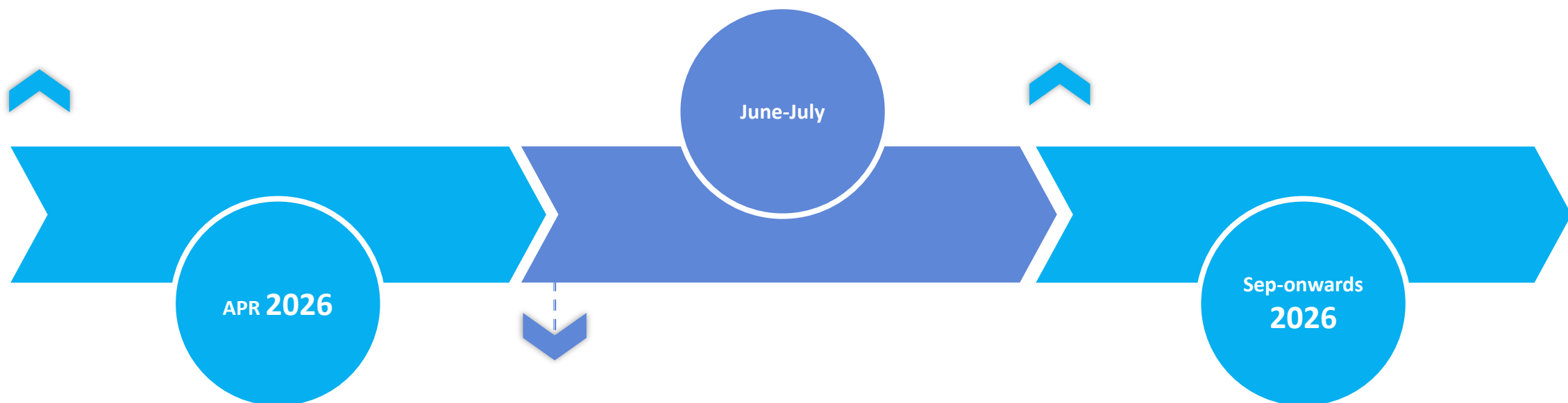
Actions: Roadmap & Timeline

Santa Marta conference

- Delivered presentation to policymakers of hosting governments
- Built coalition with 15+ new collaborations
- Follow-up conversations with governments for implementation ahead of 2027 Tuvalu TAFF conference and COP-31

Support interconnection of roadmaps

- COP-31
- Tuvalu 2027
- Launch Innovation Accelerator



Endorsement & launch

- Secure political support for approach
- Develop plans for Innovation Accelerators with banks & finance experts
- Coordinate policy and market signals to support intra-transitions

About us & How to contribute



UNITED FUTURE

Think Tank Network
for accelerated action on
sustainable development



United Future – Think Tank Network

Our role:

- Build consensus around Acceleration of energy transition among governments & private sector
- Support stakeholders in implementation

Our ask: *Join the initiative - Speed up the energy transition*

- Explore connections through a **30-minute call**:
- [Select calendar timeslot](#) or email us at Energy@unitedfuture.earth