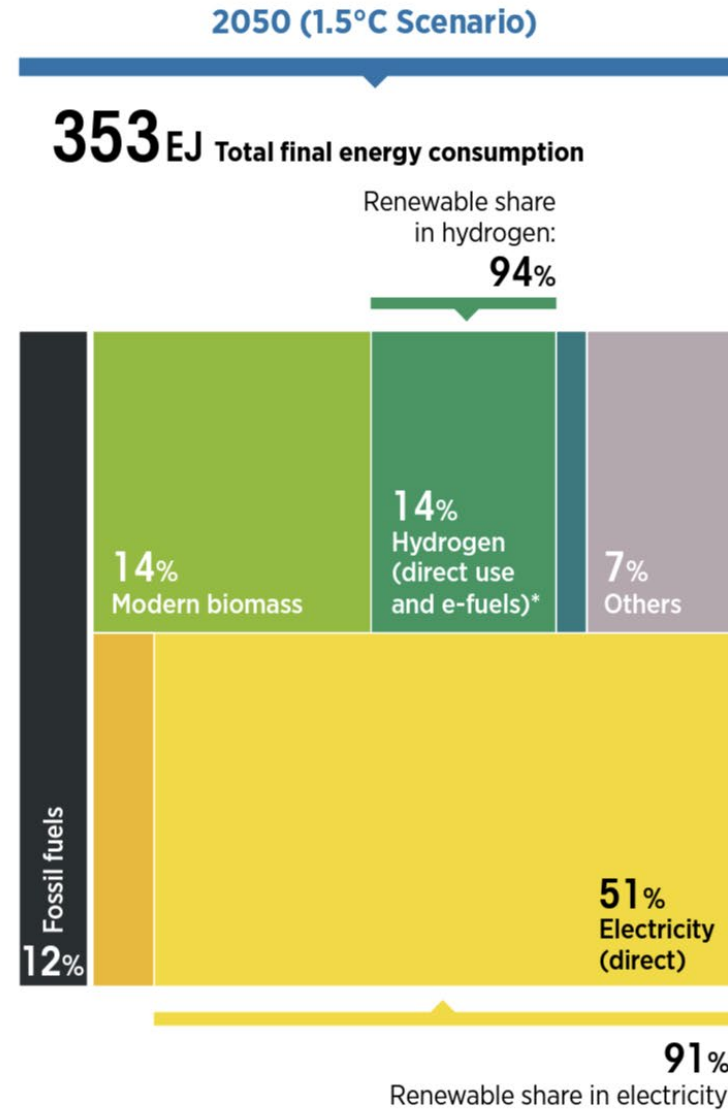
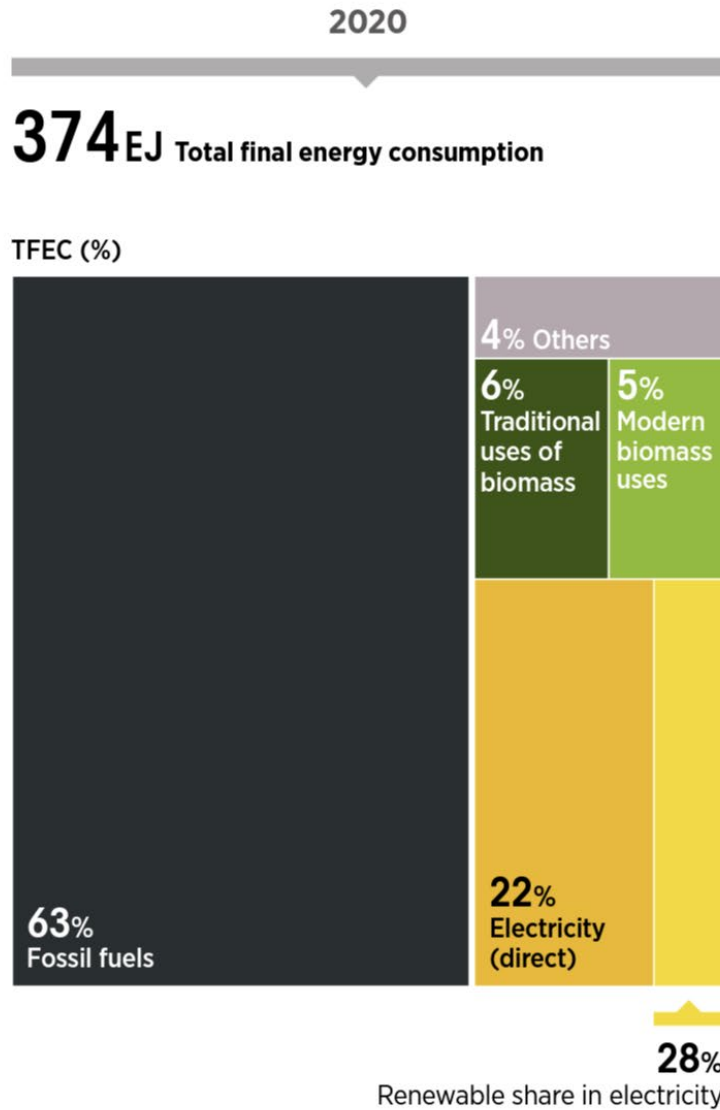


Emerging global trends on Green transition – Implications for Research, technology and Innovation

Gauri Singh
Deputy Director-General, IRENA

Trend 1: Renewable electricity will be the main energy carrier of the future

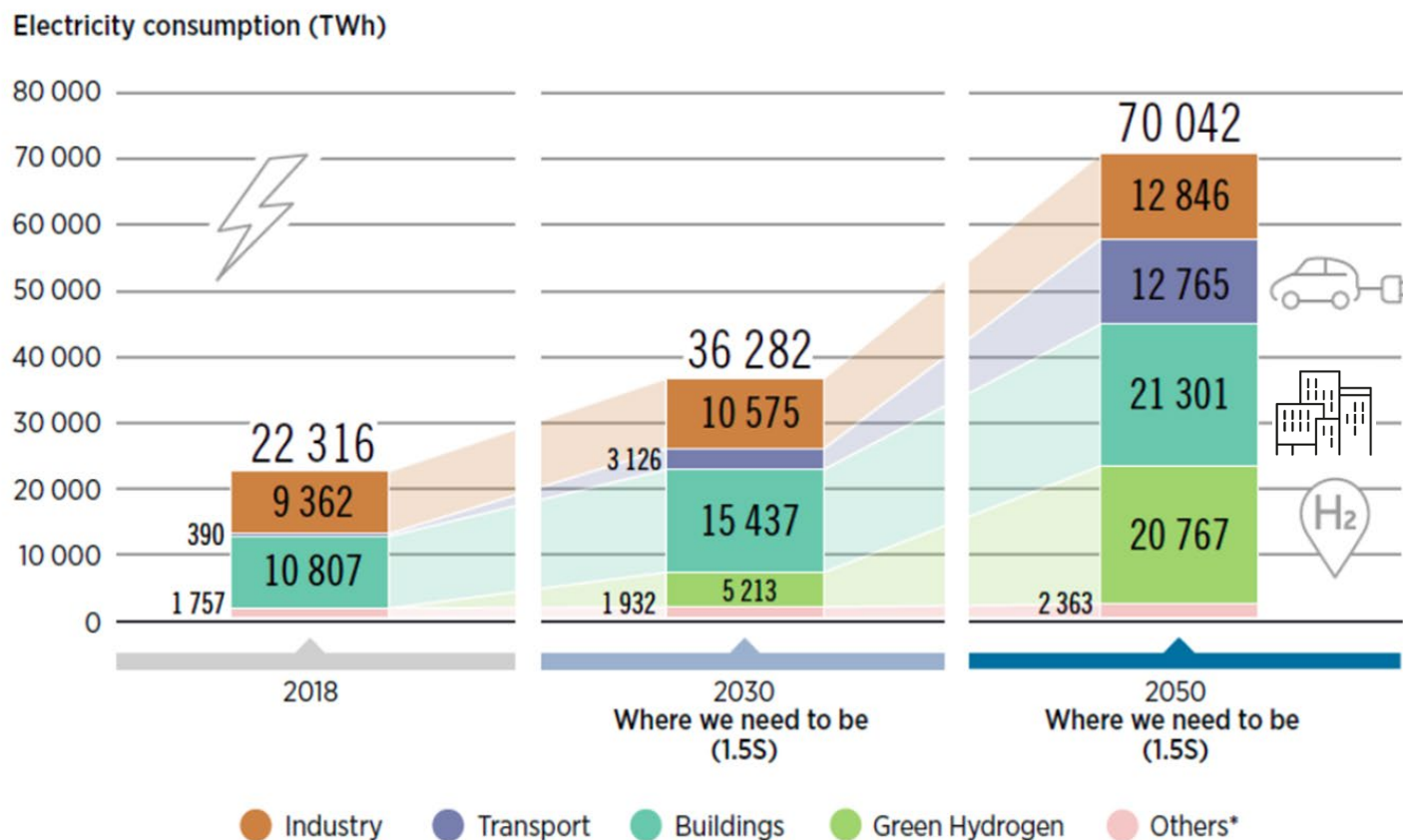


RTI Implications:

- 90% of total electricity needs will be supplied by renewables by 2050
- Direct electricity in total final energy consumption must increase from 22% in 2020 to 51% by 2050; this requires tremendous growth in electric-powered technologies and electrification of end-use sectors (electric vehicles, heat pumps)
- Smart electrification is needed to integrate the new loads in a cost-efficient manner while also integrating larger share of renewables in power systems

Trend 2: Indirect renewable electrification via green hydrogen plays a key role in HtA sectors

Electricity consumption by sector, 2018, 2030 and 2050 (TWh/yr) in the 1.5°C Scenario

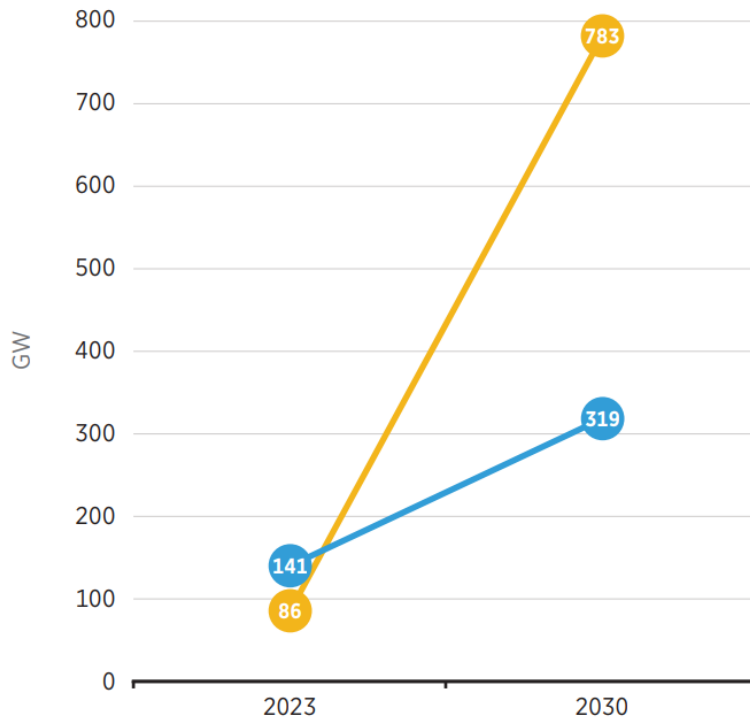


RTI Implications:

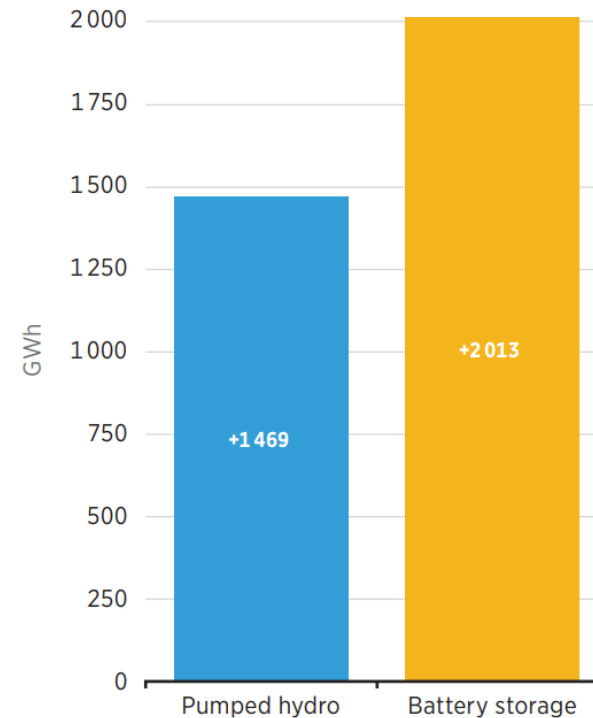
- For Hard to Abate (HtA) sectors, such as some industry sectors (chemicals, steel), aviation and shipping, indirect electrification via green hydrogen is the solution for decarbonisation.
- Green hydrogen production will grow to 523 million tonnes per year by 2050.
- This requires substantial investments in electrolyzers and other technologies to produce, deliver and use green hydrogen fuels;
- Innovation is needed to make electrolyzers more efficient and less costly.

Trend 3: Infrastructure that supports the transition becomes a priority

Total installed storage capacity (GW)



Storage GWh added (2023-2030)

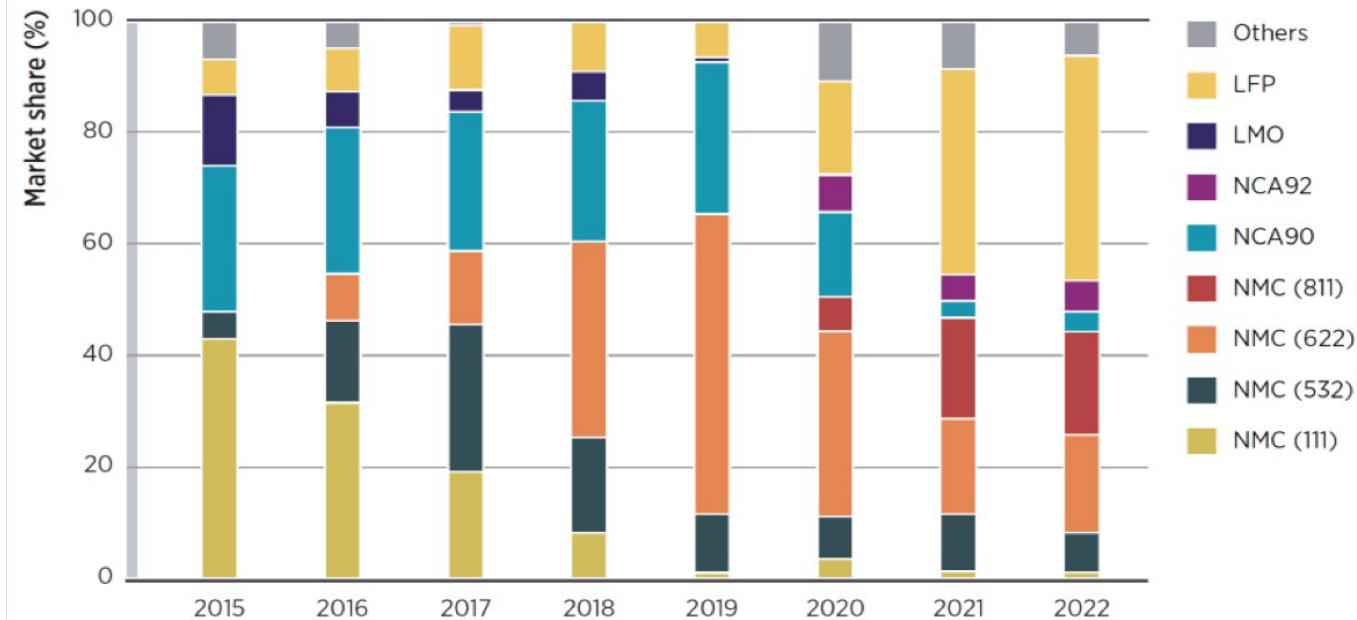


RTI Implications:

- **Energy storage systems** will grow between 6 and 8 times by 2030.
- Similarly, investments in **grid strengthening and modernization**, interconnections and digitalisation are key to support the transition.
- Also, creating demand for green products in hard to abate sectors, needs to go hand-in-hand with deploying the rights infrastructure, including **pipelines and storage hydrogen and derivatives for ports, airports** and industrial demand.

Trend 4: Ensure robust supply chains

Historical global EV battery chemistry mix between 2015 to 2022



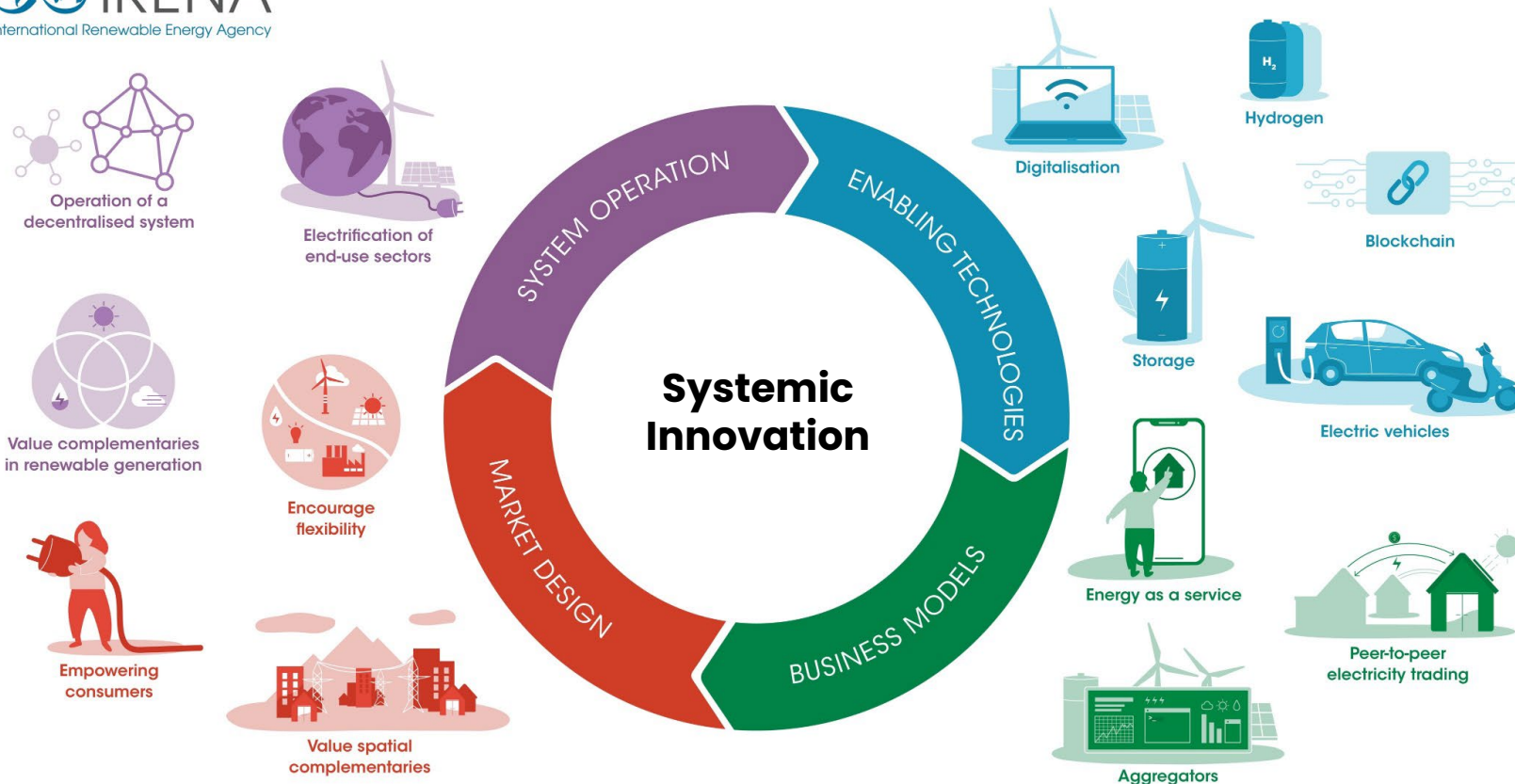
Source: BNEF, 2023

RTI Implications:

- Transparent supply chains and material traceability throughout resource life cycles are drivers for investment and better governance. The potential for co-operation over conflict in the critical materials supply chain is key.
- Decrease dependency of certain material via technological innovation: Challenges with cobalt supply resulted in innovation and fast adoption of new battery chemistry (LFP) that does not require cobalt.
- Production of sodium-ion batteries has started in 2023, with a planned production capacity of 186 GWh/y by 2030, decreasing the demand for lithium.

Trend 5: Systemic innovation is key for ensuring business case and commercialisation of innovations

It is only by matching and leveraging synergies in innovations in all parts of the power system and end-use sectors and including all relevant actors and stakeholders that successful solutions can be implemented on the ground.



RTI Implications:

- Innovation should go beyond technology. Innovation in business models, market design and regulation and system planning, and operation is crucial.
- There is no “one-size-fits-all” solution : **design tailored solutions based on country context following a systemic innovation approach.**

Trend 6: Increased international collaboration create win-win scenarios in the energy transition

IRENA INNOVATION WEEK 2023

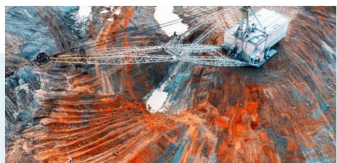
Renewable solutions to decarbonise end-use sectors



RTI Implications:

- Increase international co-operation in innovation between governments. No single country possesses all the knowledge or resources required.
- International and cross-sectoral collaboration, and among all stakeholders, is vital to developing and implementing innovative solutions effectively.
- IRENA has several platforms for international collaboration on energy innovation.

Collaborative Frameworks



Critical materials



Offshore Renewables



Geopolitics



Project Facilitation



Green Hydrogen



High Shares of Renewables



Hydropower



Just & Inclusive Energy Transition