

SECTOR OVERVIEW

May 2024

TI

Technology Innovation

MISSION STATEMENT

Accelerating the transition to digitized, resilient, equitable, integrated, and decarbonized energy networks via thought leadership and strategic R&D.

INTRODUCTION

The Technology Innovation (TI) program provides thought leadership, catalyzes novel solutions, and accelerates early-stage technologies across EPRI and the global energy sector.

Many of EPRI's highest-impact technologies and ideas have emerged from TI research and development (R&D)—superclean steels and nickel-based alloys, solid-state power electronics and transmission-class sensors, grid-interactive electric vehicles and cold-climate heat pumps, and both the integrated grid and integrated energy network.

The 2024 TI portfolio is driving innovation in grid-edge interoperability, accelerating decarbonization planning, building global collaborations in fusion energy, and pushing knowledge and technology frontiers in many other areas. More information is available at the [TI home page](#), on [TI's Strategic Insights page](#), and by subscribing to the [monthly TI e-newsletter](#).

HOW TI WORKS

TI projects, initiatives, and activities are funded by all EPRI members as a core benefit of participation and an enabler of EPRI's public mission to help advance safe, reliable, affordable, and clean energy for society.

TI's core functions are to ensure sustained investment in strategic thinking, capacity building, basic science, and exploratory research and to serve as EPRI's innovation engine. This includes both leading the industry in new directions and maintaining a full pipeline of emerging knowledge and technology for application development and implementation through EPRI's sectors.

TI engages experts across EPRI in delivering technical and business insights and in directing early-stage and long-term R&D while leveraging the expertise and resources of energy companies, utilities, technology developers, universities, national laboratories, and innovation ecosystems worldwide.

TI program direction and oversight are provided by EPRI's Research Advisory Committee (RAC), which includes senior executives from US and international utilities. The TI portfolio is developed in collaboration with EPRI's Generation, Nuclear, and Energy Delivery and Customer Solutions sectors and with members represented on the Technology Innovation Committee.

The 2024 TI portfolio, funded at about \$34 million, includes more than 200 projects and about a dozen active interest groups and participatory forums. Strategic insight, scouting, innovation capture, and technology incubation activities occur on a continuing basis.

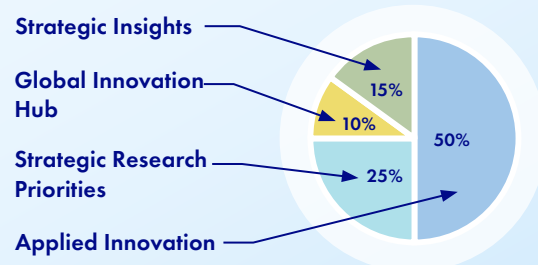
EPRI members can access all TI information resources at no additional cost—more than 150 products, digital tools, and webcasts per year—plus participate in collaborative activities. Many resources also are publicly available, free of charge, to broaden dissemination of independent R&D findings and encourage inclusive dialogue on emerging topics, trends, and technologies.

WHAT TI DOES

TI's work involves exploration, ideation, collaboration, and acceleration across four primary program components:

- **Strategic Insights:** Explores and illuminates emerging developments, technologies, opportunities, challenges, and trends.
- **Global Innovation Hub:** Broadens EPRI's collaborative reach around business, technology, policy, and market challenges.
- **Strategic Research Priorities:** Clears barriers to accelerated industry transformation, technology scaling, and decarbonization.
- **Applied Innovation:** Builds knowledge and advances technology through multi-year, cross-cutting, and sector-specific R&D.

2024 TI FUNDING ALLOCATION



STRATEGIC INSIGHTS

Exploring emerging trends and technologies, leveraging EPRI knowledge and analysis, and capturing stakeholder perspective to inform strategic thinking and drive conversation across the industry.

The TI team monitors the landscape and watches the horizon to engage EPRI and other experts in delivering insights through published resources, webcasts, and interactive tools. Visit [TI's Strategic Insights page](#) for recent and new releases. Examples include:

- **EPRI Insights & White Papers:** deep dives on issues with broad and multifaceted implications for the energy sector.
- **Spotlights & Briefs:** introductions to emerging concepts and answers to important questions.
- **Tech Radar:** interactive [digital tool](#) characterizing selected transformative technologies based on status, time to commercialization, and potential for market disruption and for economic, socio-political, and environmental impacts.
- **Tech Portal:** [online database](#) of innovative technologies, tools, business models, and applications relevant to the energy industry.

APPLIED INNOVATION

Advancing basic understanding and early-stage concepts and scaling up innovations to help maintain a full technology pipeline aligned with the roadmaps developed by EPRI's sectors.

- **Generation:** materials reliability for renewables and for fossil plant wastewater systems; digital transformation and cyber security; asset management, recycling, and circularity; carbon capture and storage modeling and testing; and environmental justice.
- **Nuclear:** advanced reactors; fusion energy; welding and manufacturing; artificial intelligence and automation; digitized components; smart chemistry; advanced fuel and waste management; spent fuel transport and disposal; and worker dose reduction.
- **Transmission & Distribution Infrastructure:** information, communications, and cyber security technology; component-level innovation; asset monitoring and management; and environment, health, and safety.
- **Integrated Grid & Energy Systems:** grid planning, modeling, management, and control for reliability, resilience, and decarbonization; interoperability of renewables and distributed energy resources; and equity and environment.
- **Electrification & Sustainable Energy Strategy:** charging infrastructure; heat pumps; grid-interactive buildings; consumer behavior and participation; distributed storage; nature-based solutions; and equity and sustainability.

GLOBAL INNOVATION HUB

Engaging EPRI members and industry stakeholders and fostering broad dialogue and coordinated action to build internal capabilities, expand innovation ecosystems, and accelerate technology demonstration.

- **Global Innovation Excellence Project**
- **Technology Forums & Interest Groups**
- **[Incubatenergy® Labs](#) & [Incubatenergy Network](#)**
- **Open, Targeted & University Innovation Challenges**

STRATEGIC RESEARCH PRIORITIES

Focusing investment, leveraging resources, and accelerating progress in filling key technology, market, and capability gaps to help meet 2035 milestones toward a fully decarbonized grid by 2050.

To address the five strategic priorities established by the RAC and EPRI's Board of Directors in 2020, TI helped catalyze broad, high-impact work on integrated system planning and resource adequacy, as well as the ongoing [Low-Carbon Resources](#), [Climate READi](#), and [EVs2Scale](#) initiatives. As of 2024, the TI focus is on areas where investment and engagement by EPRI and industry—in collaboration with global stakeholders—can accelerate progress over the next 3 to 5 years:

- **Clean Energy:** reducing the costs and risks of deploying advanced nuclear reactors and carbon capture and storage systems and developing the workforce needed to accelerate clean energy deployment and decarbonization.
- **Electric System Flexibility:** understanding flexibility requirements and capabilities and enabling interoperability and resource adequacy across grid-interactive loads, distributed energy resources, and load-serving assets.
- **Energy System Reliability & Resilience:** improving reliability and resilience for the electric sector and broader energy system, accounting for network interactions, cyber and physical security, and climate change.
- **Building & Industry Decarbonization:** accelerating electrification and decarbonization of buildings and industry by addressing factors driving technology adoption and influencing customer behavior.
- **Market Transformation:** fostering cost-effective and equitable market mechanisms and pricing strategies to influence grid planning and operations, investment in and operation of load-serving resources, and customer behavior.