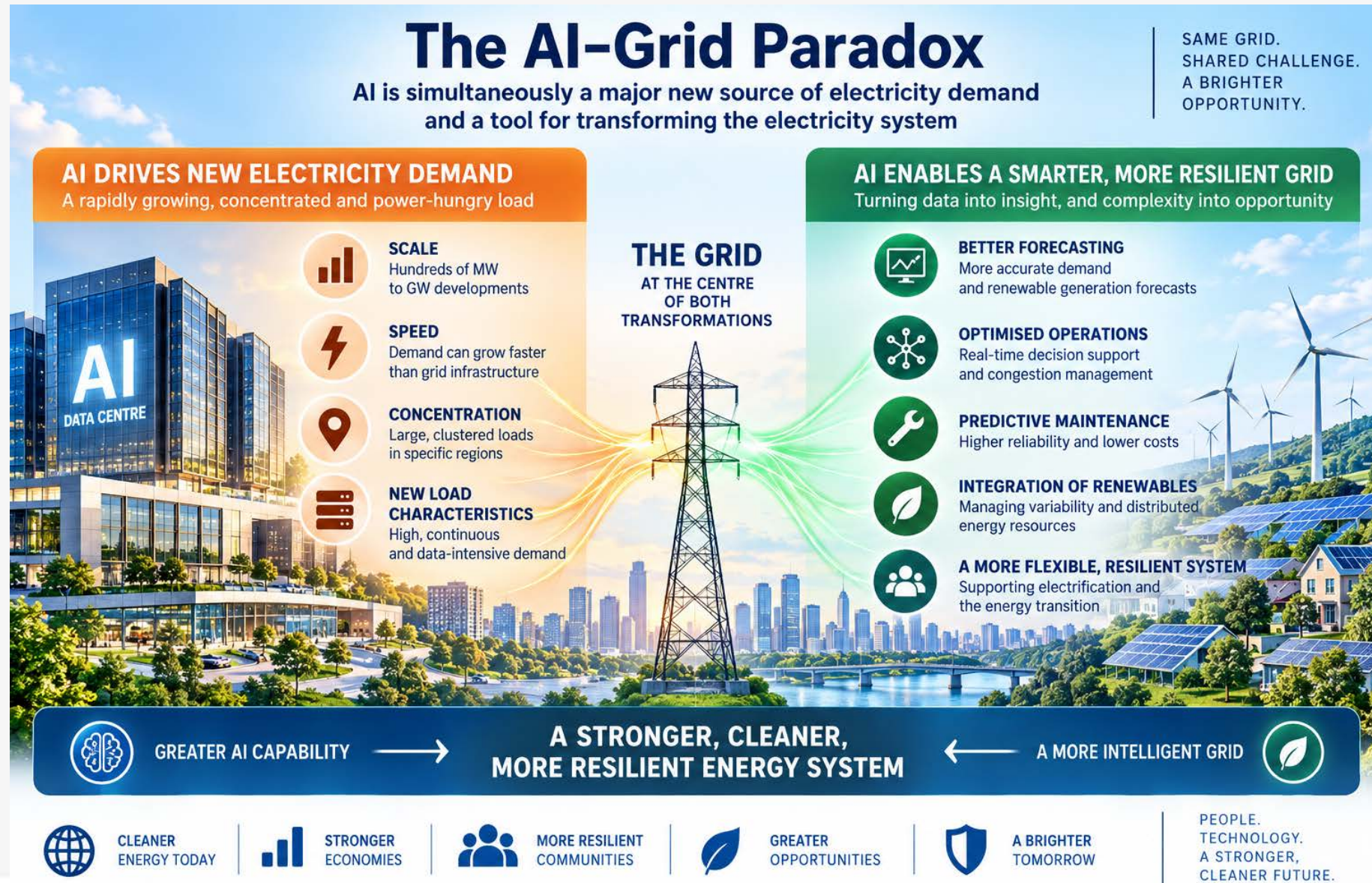


AI & the power grid - Turning a new energy challenge into an accelerator of the transition

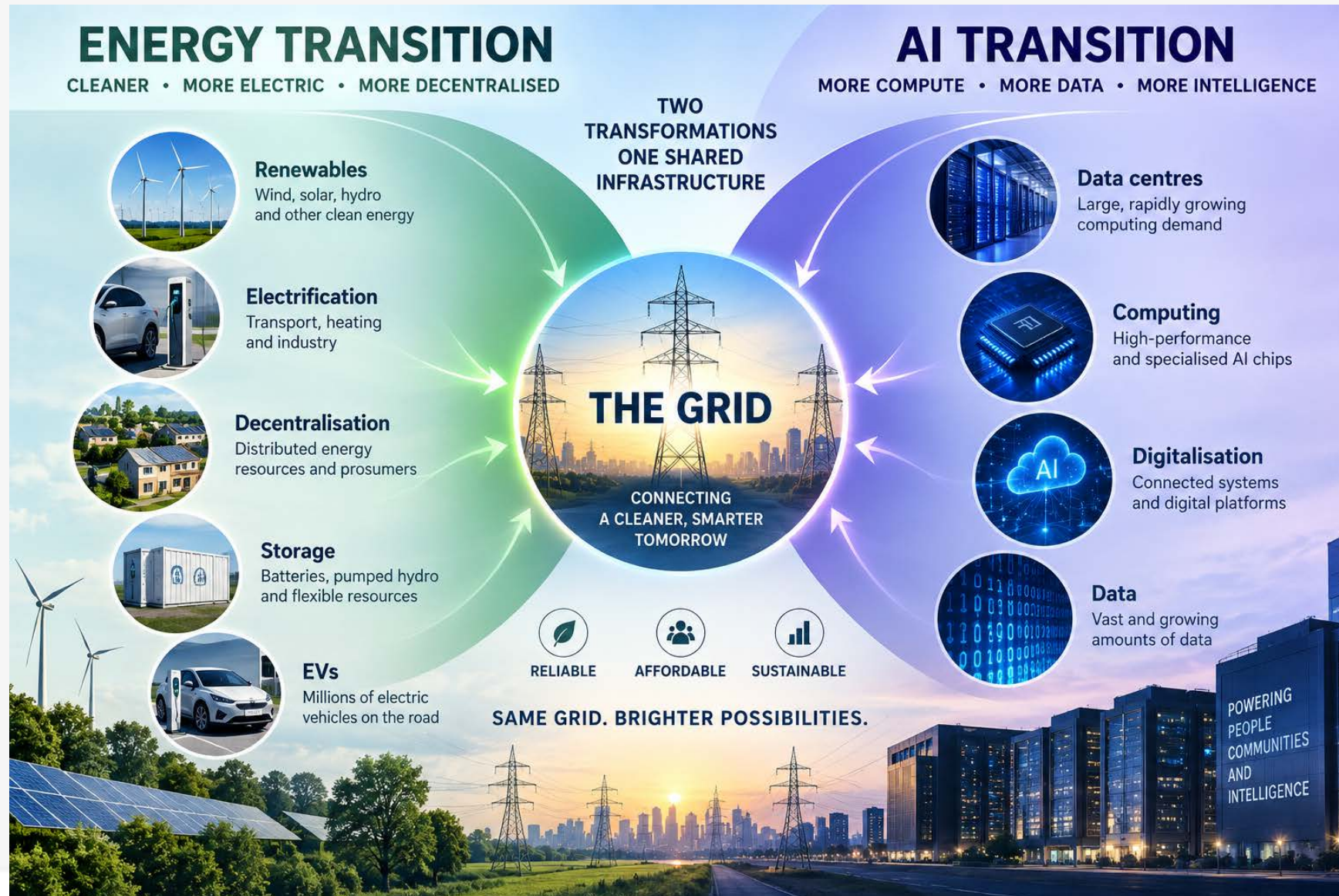
Philippe ADAM, CIGRE Secretary General



AI needs the grid. The grid increasingly needs AI



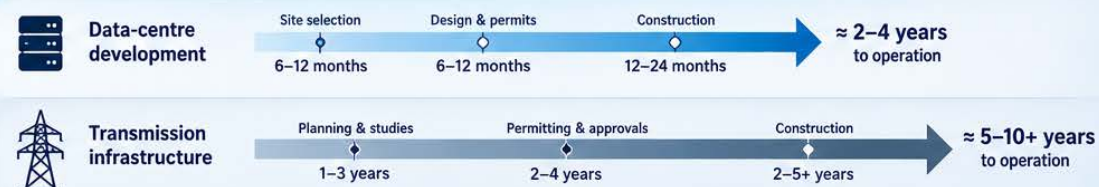
Two transformations are converging on the grid



AI is creating a new class of electricity demand



A TALE OF TWO TIMELINES



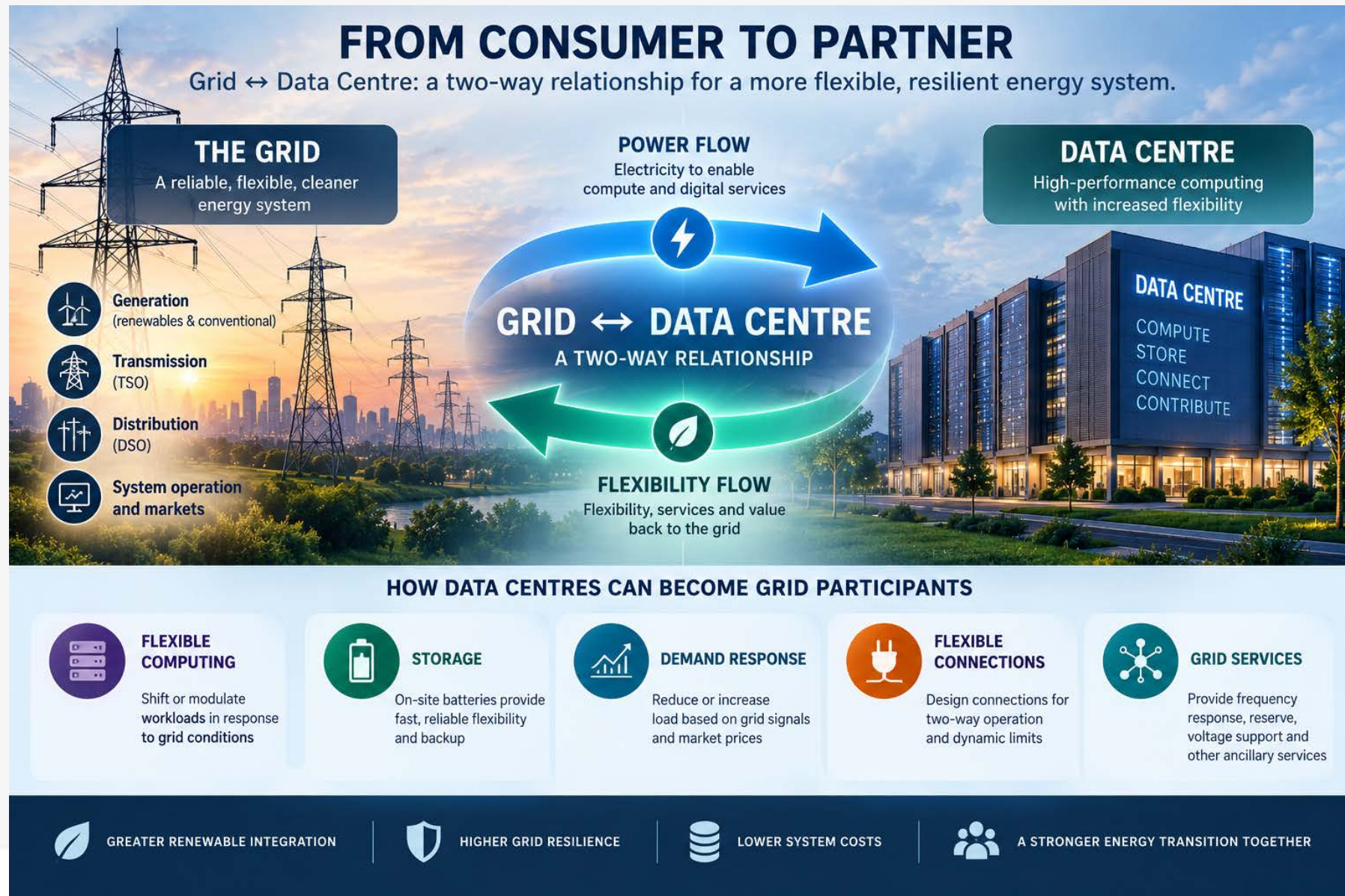
**NEW DEMAND.
NEW TIMESCALES.
A NEW CHALLENGE
FOR THE GRID.**



AI is not just changing how we use electricity — it is changing the scale, speed and geography of demand. Utilities and policymakers need to plan for a new class of loads, with a new sense of urgency.

POWERING
INTELLIGENCE
SUSTAINING
SOCIETY

The strategic question: load or grid asset?



The energy transition is also making the grid more complex



A MORE COMPLEX POWER SYSTEM

MORE SOURCES. MORE PLAYERS. MORE INTERACTIONS. A CLEANER, MORE ELECTRIFIED WORLD.



DATA × **VARIABLES** × **UNCERTAINTY** × **DECISIONS**

More data from more sources More elements to manage More volatility and less predictability More complex and time-critical choices

=

UNPRECEDENTED OPERATIONAL COMPLEXITY

**MORE COMPLEXITY
GREATER OPPORTUNITY**



**A SMARTER GRID
FOR A BRIGHTER
TOMORROW**



CLEANER ENERGY



MORE PARTICIPATION



HIGHER RESILIENCE



GREATER EFFICIENCY



A STRONGER, MORE SUSTAINABLE FUTURE

AI can help utilities do more with the grid we already have



AI ACROSS THE POWER GRID VALUE CHAIN

FROM PLANNING TODAY TO A MORE RESILIENT TOMORROW

SAME GRID.
MORE POSSIBILITIES.



AI ENABLES A MORE EFFICIENT, RESILIENT AND SUSTAINABLE POWER SYSTEM



LOWER COSTS



HIGHER RELIABILITY



BETTER CUSTOMER SERVICE



ACCELERATED ENERGY TRANSITION

PEOPLE + AI

A STRONGER GRID TOGETHER.

This is not about replacing engineers - It is about augmenting them



AI AS COPILOT, NOT AUTOPILOT

HUMAN EXPERTISE. AI CAPABILITIES. A SAFER, STRONGER GRID.

CRITICAL INFRASTRUCTURE DEMANDS RESPONSIBLE AI.

COPILOT: HUMAN + AI

Augmented decision-making for better outcomes

A MORE RESILIENT CLEAN ENERGY FUTURE

AI INSIGHTS

- Forecasts
- Anomaly alerts
- Risk assessment
- Optimisation options
- Scenario analysis

HUMAN DECISION

- Review insights
- Apply expertise
- Consider context
- Make decision
- Take responsibility

AUTOPILOT: AI ALONE

Higher risk, especially in critical infrastructure

AUTONOMOUS MODE

DECISIONS WITHOUT HUMAN OVERSIGHT

- RISK OF UNEXPLAINED ACTIONS
- GREATER IMPACT OF ERRORS
- LOSS OF HUMAN CONTEXT
- TRUST AND ACCEPTANCE CHALLENGES

IN A POWER SYSTEM, AN AI ERROR CAN HAVE PHYSICAL CONSEQUENCES.

AI HANDLES DATA & COMPLEXITY

- Processes large volumes of data
- Detects patterns and anomalies
- Generates insights and options
- Works at speed and scale

PEOPLE RETAIN EXPERTISE, ACCOUNTABILITY AND AUTHORITY

- Bring domain knowledge and experience
- Understand system context and trade-offs
- Make and own the final decision
- Ensure safety, ethics and public trust

SAFER OPERATIONS

HIGHER RELIABILITY

BETTER DECISIONS

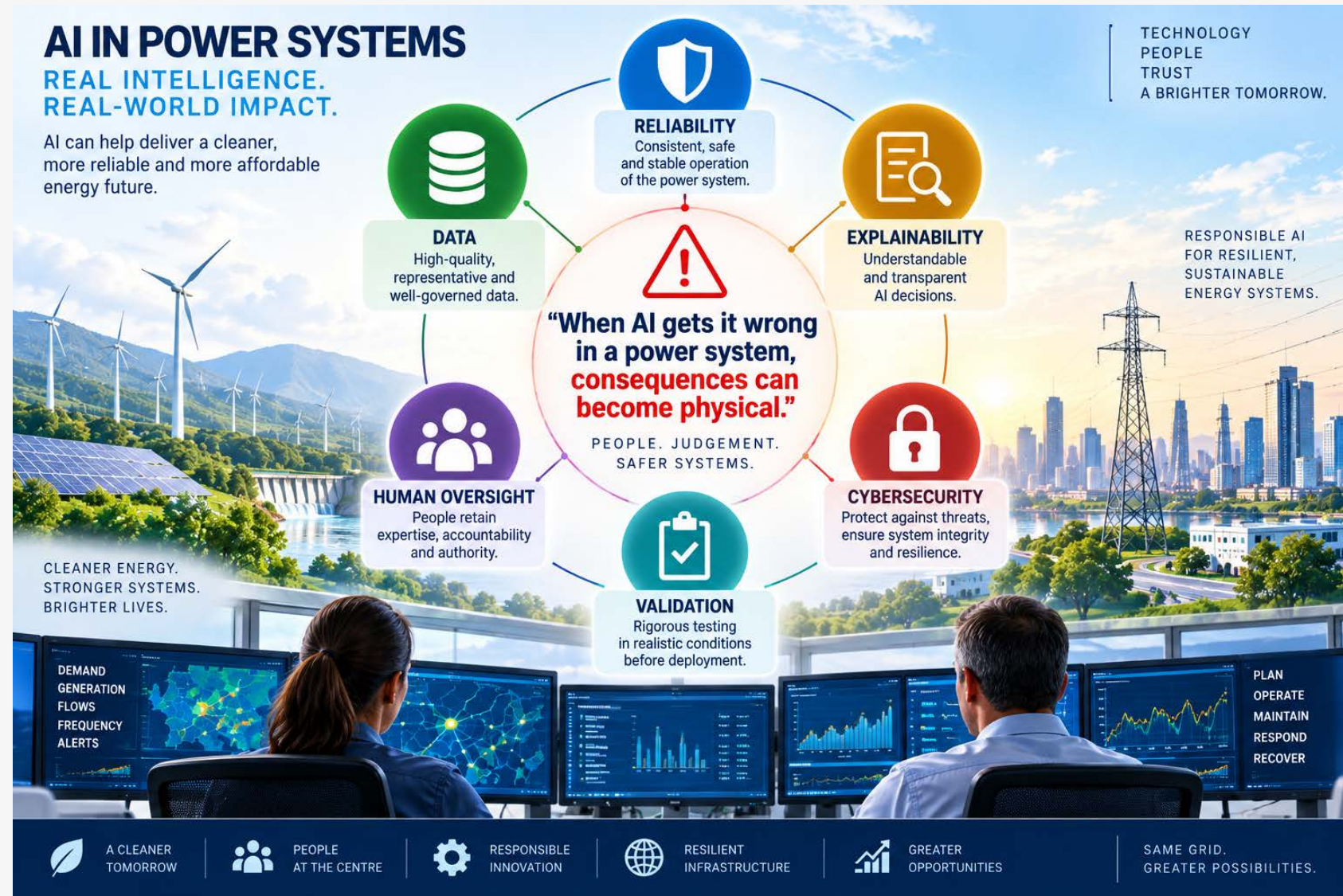
TRUSTED DEPLOYMENT

A STRONGER, CLEANER ENERGY FUTURE

PEOPLE + AI = A MORE RESILIENT, RELIABLE AND SUSTAINABLE POWER SYSTEM

SAME GRID. BRIGHTER TOMORROW.

But utility AI is different from consumer AI



Five barriers separate AI pilots from industrial deployment



CIGRE: Where global power system experience becomes shared knowledge



A GLOBAL COMMUNITY FOR A SUSTAINABLE ELECTRICITY FUTURE



Founded in Paris
in **1921**

A global, non-profit community dedicated to advancing power-system knowledge and expertise for a more sustainable energy future.

BRINGING TOGETHER THE ENTIRE POWER-SECTOR ECOSYSTEM



Utilities & Operators

REAL-WORLD EXPERIENCE



Manufacturers

TECHNOLOGY & SOLUTIONS



Academia

RESEARCH & TALENT



Technology Providers

INNOVATION & DIGITALISATION



SHARING
KNOWLEDGE
BUILDING TOGETHER
A STRONGER
POWER SYSTEM

PEOPLE
IDEAS
EXPERTISE
FOR A BRIGHTER
ENERGY TOMORROW

*From Paris
to a brighter tomorrow*

FROM EXPERTISE TO IMPACT

A UNIQUE KNOWLEDGE CREATION CHAIN, FROM TECHNICAL EXPERTISE TO REAL-WORLD APPLICATION.



ENABLE
THE ENERGY TRANSITION



CONNECT
PEOPLE WORLDWIDE



SHARE
INDEPENDENT KNOWLEDGE



SUPPORT
BETTER DECISIONS



BUILD
A MORE RESILIENT
AND SUSTAINABLE FUTURE

CIGRE is building an international AI knowledge agenda



AI AT CIGRE: A RAPIDLY EVOLVING AGENDA

FROM EXPERTISE TO IMPACT

PEOPLE
KNOWLEDGE
COLLABORATION
A STRONGER
POWER SYSTEM



2022 – 24

WG C2.42

AI in operation & control

CIGRE Working Group C2.42 develops knowledge on the use of AI in power-system operation and control.



2025

Montréal Session

AI / grid-modernisation discussion

CIGRE community discusses AI and grid modernisation, sharing experiences, challenges and opportunities across the global power system.



2026

Paris Session

AI / data centres elevated to strategic level

CIGRE Paris Session places AI and data centres on the strategic agenda, recognising their major impact on the future power system.



2022 – 24

BUILDING KNOWLEDGE

2025

SHARING AND ACCELERATING

2026

A STRATEGIC STEP FORWARD



GLOBAL KNOWLEDGE
FOR A BRIGHTER,
MORE SUSTAINABLE
ENERGY FUTURE.

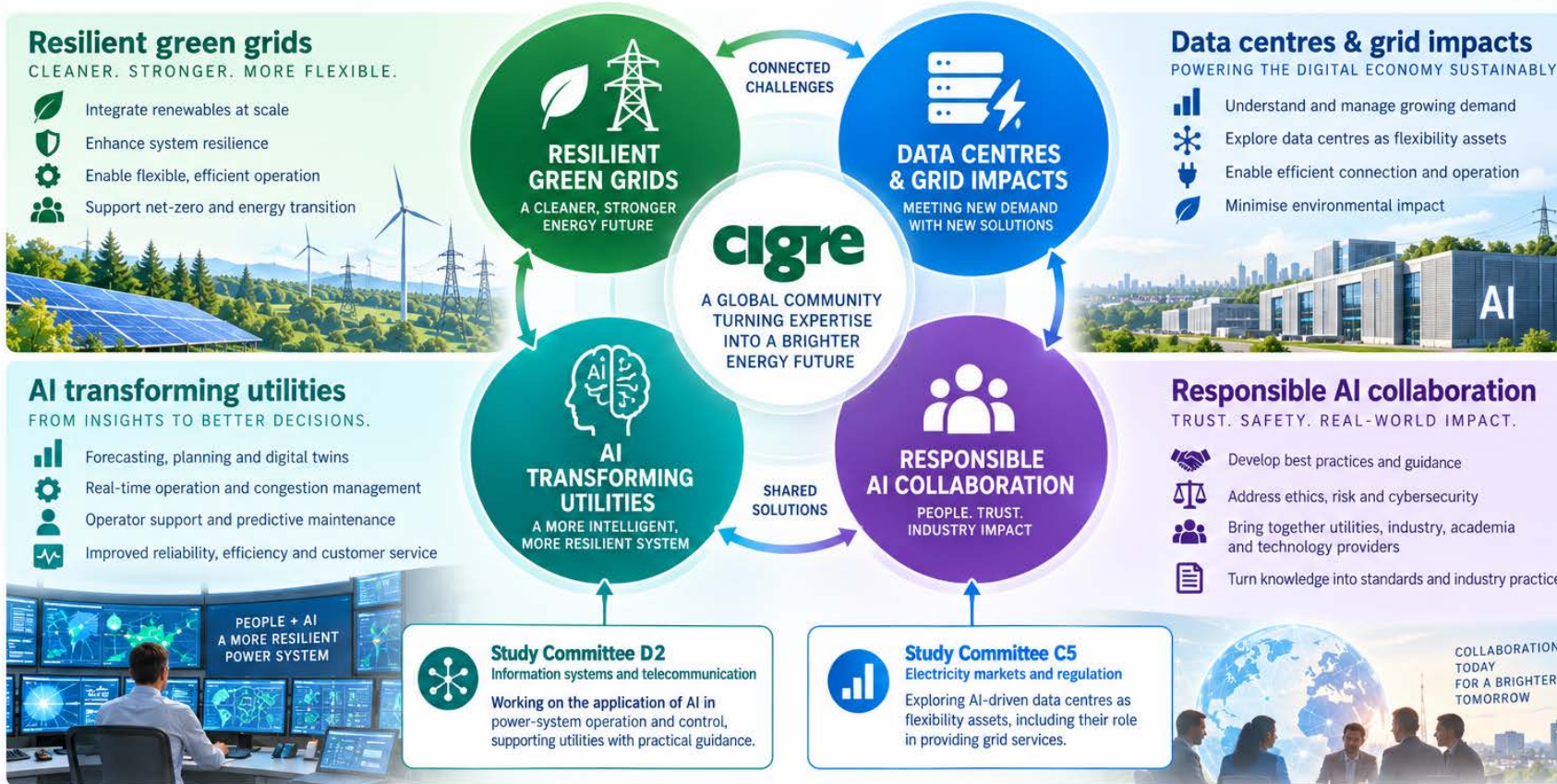
2026: Connecting AI demand and AI solutions



Four interconnected areas for a stronger, cleaner, more digital power system

PEOPLE · KNOWLEDGE · COLLABORATION · REAL-WORLD IMPACT

SHARING
KNOWLEDGE
BUILDING TOGETHER
A STRONGER
POWER SYSTEM



A GLOBAL
COMMUNITY



TECHNICAL KNOWLEDGE
INTO PRACTICE



ACROSS BORDERS
AND DISCIPLINES



FOR A SUSTAINABLE
ENERGY FUTURE

*From knowledge
to a brighter tomorrow*

From innovation to trusted industry practice



Bridging Experience to Global Standards for a Stronger Power System

PEOPLE · KNOWLEDGE · COLLABORATION · REAL-WORLD IMPACT

A CLEANER
MORE RESILIENT
AND MORE
PROSPEROUS
ENERGY FUTURE

UTILITIES & SYSTEM OPERATORS
REAL-WORLD EXPERIENCE. REAL CHALLENGES.

- Operate and maintain power systems
- Face practical challenges and new technologies
- Provide operational experience and lessons learned
- Identify real-world needs and priorities

KEEPING SOCIETY POWERED

REAL-WORLD EXPERIENCE DRIVES PROGRESS

cigre
A GLOBAL COMMUNITY OF POWER SYSTEM EXPERTS

For a stronger power system

CONNECTING EXPERIENCE, KNOWLEDGE AND STANDARDS FOR A STRONGER POWER SYSTEM

- GLOBAL COLLABORATION**
Utilities, academia, manufacturers, technology providers
- WORKING GROUPS**
Technical analysis and knowledge creation
- INTERNATIONAL TECHNICAL CONSENSUS**
CIGRE Technical Brochures and guidance
- OPEN DIALOGUE WITH STANDARDS ORGANISATIONS**
Feeding into international standardisation

NEUTRAL · INCLUSIVE · GLOBAL

INTERNATIONAL STANDARDS ORGANISATIONS
GLOBAL STANDARDS. GLOBAL IMPACT.

IEC

IEEE PES
Power & Energy Society®

- Develop international standards and methodologies
- Provide complementary technical guidance
- Enable global interoperability and market development
- Support implementation at scale

COMMON STANDARDS A STRONGER TOMORROW

STANDARDS ENABLE A MORE CONNECTED AND EFFICIENT POWER SYSTEM



CIGRE's distinctive value is the bridge between real-world power-system experience and internationally shared technical practice.

FROM KNOWLEDGE
TO PRACTICE
FOR A BRIGHTER TOMORROW

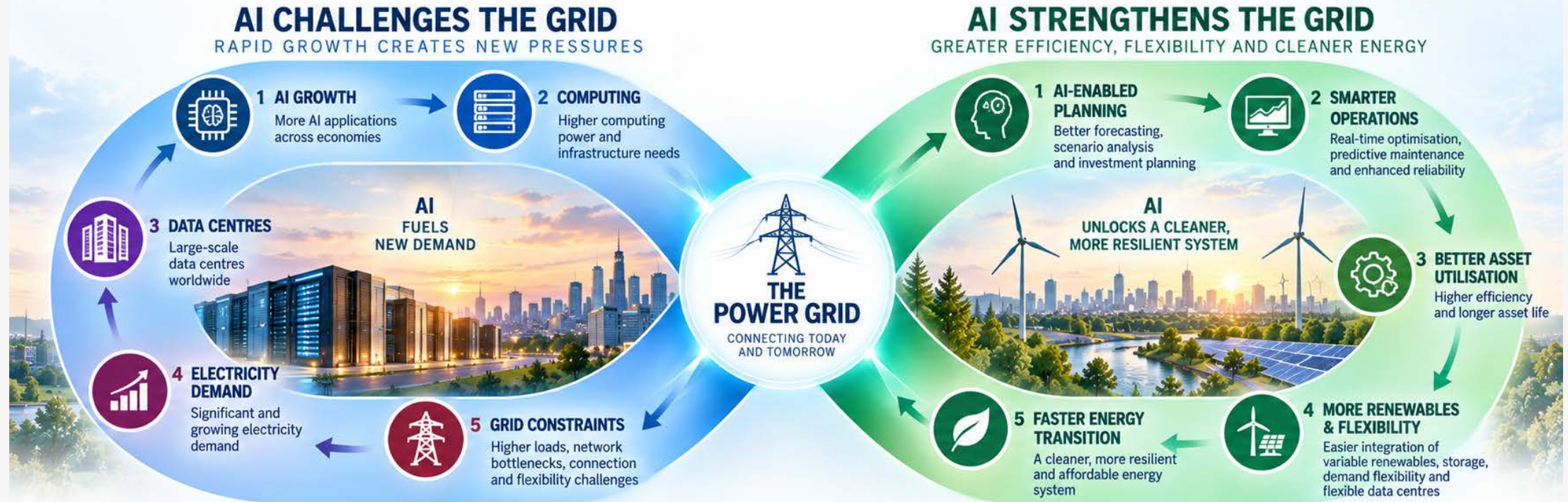
The opportunity: turn the AI challenge into a virtuous circle



AI: A VIRTUOUS CIRCLE FOR A STRONGER ENERGY FUTURE

NEW DEMAND. SMARTER GRIDS. A CLEANER TOMORROW.

PEOPLE
KNOWLEDGE
COLLABORATION
A STRONGER
POWER SYSTEM



The strategic challenge is to make these two loops reinforce each other.

TURNING TODAY'S CHALLENGES INTO TOMORROW'S OPPORTUNITIES.



A GLOBAL
COMMUNITY



BRINGING TOGETHER
EXPERTS



FROM KNOWLEDGE
TO PRACTICE



FOR A MORE RESILIENT
AND SUSTAINABLE ENERGY FUTURE

*Together
for tomorrow's
energy system*

Five questions every utility CEO should ask now



FIVE QUESTIONS EVERY UTILITY CEO SHOULD ASK NOW

AI TODAY. A STRONGER, MORE RESILIENT ENERGY TOMORROW.

PEOPLE
KNOWLEDGE
COLLABORATION
A STRONGER
POWER SYSTEM

1 DEMAND

Are we ready for the speed and scale of AI-driven electricity demand?



ANTICIPATE AND PLAN FOR GROWTH

2 FLEXIBILITY

Are we treating data centres only as loads, or as potential grid resources?



UNLOCK FLEXIBILITY FOR A STRONGER, MORE EFFICIENT GRID

3 VALUE

Where can AI create measurable value in our utility today?



TURN AI INTO REAL-WORLD VALUE

4 TRUST

Do we have the governance to deploy AI in critical infrastructure?



- SAFETY
- SECURITY
- ETHICS
- ACCOUNTABILITY
- TRANSPARENCY

DEPLOY AI SAFELY AND RESPONSIBLY

5 COLLABORATION

Are we helping shape the rules, or waiting for them?



SHAPE THE FUTURE TOGETHER



FROM TODAY'S QUESTIONS TO TOMORROW'S OPPORTUNITIES.

*Together for
a cleaner, more resilient
energy future.*

AI will **increase the demands** placed on the world's electricity grids.

Used intelligently, it can also **help us build the grids** needed for the energy transition.



FASTER
AI INNOVATION



MORE
COMPUTING



LARGER
DATA CENTRES



HIGHER
ELECTRICITY
DEMAND



GREATER
PRESSURE ON
GRIDS



AI-ENABLED
PLANNING
AND FORECASTING



SMARTER
OPERATIONS



BETTER ASSET
UTILISATION



MORE
RENEWABLES
AND FLEXIBILITY



CLEANER,
MORE RESILIENT
GRIDS

A
STRONGER,
CLEANER,
MORE RESILIENT
ENERGY FUTURE

Our opportunity is to
shape both transformations **together**.



PEOPLE
Powering progress
together



CLEANER
Accelerating
decarbonisation



MORE RESILIENT
Strengthening
energy security



GREATER OPPORTUNITIES
For economies
and communities



cigre

For a stronger power system

PEOPLE
KNOWLEDGE
COLLABORATION
A STRONGER
POWER SYSTEM

AI
BUILDS
TOMORROW

AI
POWERS
A CLEANER
BRIGHTER
TOMORROW