• **Mission:** to foster technological innovation and excellence for the benefit of humanity.

• **Vision:** be essential to the global technical community and to technical professionals everywhere, and be universally recognized for the contributions of technology and of technical professionals in improving global conditions.

**Visualizing sustainable solutions**
The Good News
The Bad News
What we can do about it

IEEE San Diego Section
2018 Annual Awards Luncheon
Keynote

Peter Meisen, Director
Global Energy Network Institute
www.geni.org  www.wrsc.org
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Visualizing sustainable solutions
How do we make the world work for 100% of humanity in the shortest possible time through spontaneous cooperation without ecological damage or disadvantage to anyone.

World Game™ mission

Buckminster Fuller 1895 -1993
“Highest priority objective” - *tap abundant renewable energy resources around the world and link grids via high-voltage transmission.*
Earth from Space

What do we see – and not see?

Visualizing sustainable solutions
Wealthy vs. Poor

1.3 billion people still have no electricity

Visualizing sustainable solutions
Key Distinctions

Not all lights are equal.

75% of these lights are powered by fossil fuels or nuclear, except...
Renewable Energy leadership

Hydro, wind, solar and geothermal interconnected via high-voltage energy grids

Visualizing sustainable solutions
High-voltage transmission networks in U.S. Western, Eastern and Texas

United States transmission grid  
Source: FEMA

Visualizing sustainable solutions
100% Renewable Energy . . .

is there enough?
The Renewable Energy Potential of our planet is 1,500x our needs

The amount of sunlight received in one hour, if converted to electrical energy, would meet the world’s power demand for one year!
IEEE panels, CIGRE exhibit, Magazine features, World Energy Congress

GENI pushed this initiative around the world.

Visualizing sustainable solutions
Renewables are now capturing *lion’s share of new energy generation capacity*

**NEW CAPACITY FROM RENEWABLES AND FOSSIL FUELS**

![Graph showing new capacity from renewables and fossil fuels from 2001 to 2015.](image)

**SHARE OF NEW ELECTRICITY CAPACITY FROM RENEWABLE SOURCES IN 2016**

- **86%** EU + 21 GW
- **61%** United States + 16 GW
- **52%** China + 64 GW
- **44%** India + 13 GW

Worldwide capacity added: **150 GW**

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*Data not yet available for Canada or globally.*

Source: Wind Europe; U.S. Energy Information Administration; China Electricity Council; Government of India, Ministry of Power, Central Electricity Authority

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Visualizing sustainable solutions
So what’s the problem?

1992: 87% of primary energy from fossil fuels

2017: 85% of primary energy from fossil fuels

Only a 2% gain in 25 years!
What are the consequences now?

Thomas Fire

Montecito Flood

Lake Oroville 2014

Visualizing sustainable solutions
How are engineers doing?

What’s REALLY important?

Visualizing sustainable solutions
World Scientists’ 2nd Global Warning to Humanity

From 1992 to 2016: 8 of 9 threats have gotten worse in the past 25 years.

Alliance of World Scientists
William J. Ripple et al

Visualizing sustainable solutions
Aquifer Depletion

Satellite system flags stressed aquifers

More than half of Earth’s 37 largest aquifers are being depleted, according to gravitational data from the GRACE satellite system.

SOURCE: Water Resources Research

PATTERSON CLARK / THE WASHINGTON POST

Aral Sea

Visualizing sustainable solutions
Fishery Depletion

OUR OCEANS ARE IN CRISIS

85% OF OUR OCEANS ARE AT THEIR LIMITS

53% fully exploited
32% overexploited

85% at their limits

Visualizing sustainable solutions
Dead Zones increasing

Chesapeake Bay

Great Barrier Reef

Visualizing sustainable solutions
Deforestation

"If the current rate of deforestation continues, it will take less than 100 years to destroy all the rainforests on the earth"

NASA Earth Observatory

Visualizing sustainable solutions
Species extinction

Of all species that ever existed on Earth, 99% are now extinct.

Don’t look now, but that trend may be gaining steam.
Center for Biological Diversity

caued by us.

Visualizing sustainable solutions
CO₂ Emissions

Temperature and CO₂ from Antarctic ice cores over the past 800,000 years

CO₂ concentration, ppmv

Antarctic temperature, °C

Years before present

Current

400
350
300
250
200
150

Image: Jeremy Shakun/Harvard University

China affects us all

Visualizing sustainable solutions
Temperatures increasing

Earth’s surface temperature, 1880-2016

GISS Surface Temperature Analysis, NASA

New Orleans

Iowa

Visualizing sustainable solutions
Population growth

Growth in Megacities

*Cities containing more than 10 million inhabitants.

Los Angeles
New York
Mexico City
Sao Paulo
Mumbai
Cairo
Dhaka
Shanghai
Tokyo
Seoul
Bangkok

Population Growth of Largest Cities

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Visualizing sustainable solutions

National Geographic Society
And United Nations

Dhaka
Our problems are growing faster than our collective ability to solve them

- What’s missing?
  Scale
  Speed
  Optimal design
Across all nations

Visualizing sustainable solutions
Where do we go to grapple with the most challenging issues of our time?

Visualizing sustainable solutions
We need an **accelerator**

- Visualize past trends and future projections
- Provides immersive experience
- Collaborative problem solving
- Interconnected – *we learn faster together.*
- For researchers, engineers, economists, educators, business leaders and policy makers **to design, fund and build solutions quicker.**
We have control rooms for space
Control rooms for war

Visualizing sustainable solutions
Control rooms for business

Visualizing sustainable solutions

P&G
Why not a Mission Control for global sustainability?
where we can visualize solutions, share strategies and measure results

San Diego demo

What’s needed today

Vision in 1969

Visualizing sustainable solutions
“YOU NEVER CHANGE THINGS BY FIGHTING THE EXISTING REALITY. TO CHANGE SOMETHING, BUILD A NEW MODEL THAT MAKES THE EXISTING MODEL OBSOLETE”

-BUCKMINSTER FULLER

The SIMCenter was originally proposed for the Montreal Dome in 1967

Visualizing sustainable solutions
World Resources Simulation Center

Visualizing sustainable solutions to global and local problems so society make informed choices quicker

.... because we are running out of time!
We have control rooms for space, war and business -- why not for global sustainability?

Visualizing sustainable solutions
How do we get it done? What’s needed:

• **Space** – on university or corporate campuses 5,000–20,000 sq. ft.

• **Technology** – latest visualization tools, digital floor, simulation and communication software

• **Funding** - $2 million/year for staff & operations

• **Institutional Partners, Smart people** – committed engineers, regional planners, GIS mappers, IT developers, sustainability researchers and students.
Why are we here:

• to foster technological innovation and excellence for the benefit of humanity.

• to be essential to the global technical community everywhere in improving global conditions.

• to solve problems.
Thank you!

Join us in making a global impact:

- Peter Meisen, Director
- Global Energy Network Institute
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