

Emerging Energy Technology

Climate Change Steering Committee

Sept. 3, 2014

Roger Duncan

Parameters

- Technology development to 2050
- Tech most likely to affect GHG goals in Austin
- Time frames – near, intermediate and far future.
- Tech development, not deployment

Tech covered

Efficiency

Wind

Solar

Nuclear

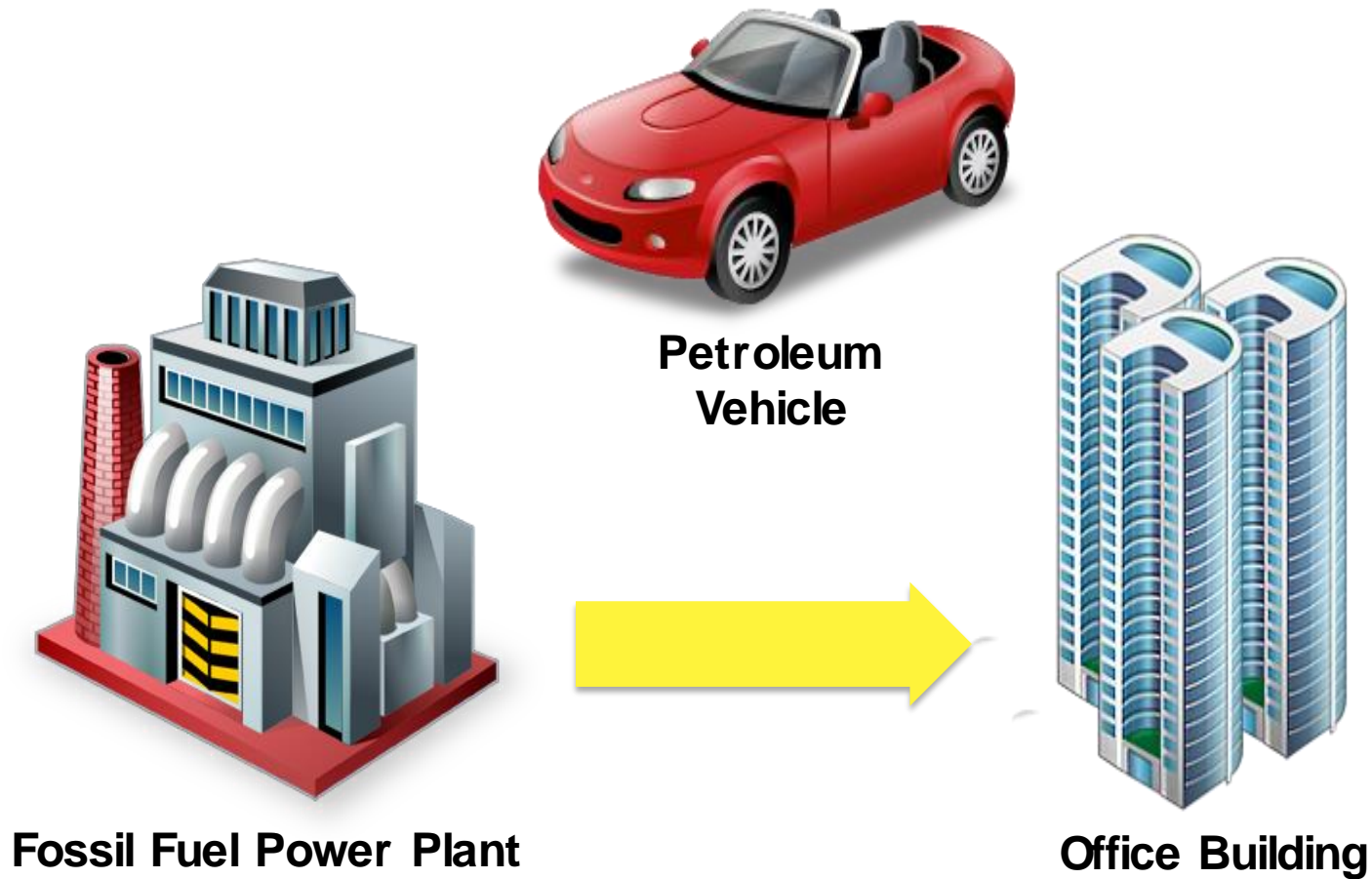
Fossil Fuels

Storage

Other

Robotics, AI and Nanotechnology

Conventional Energy System



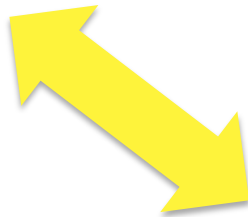
Sentient Appearing Autonomous Unified Energy System



Zero Energy Home



Distributed Utility



Fossil
Fuels

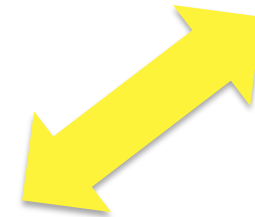


Nuclear

Solar



Wind



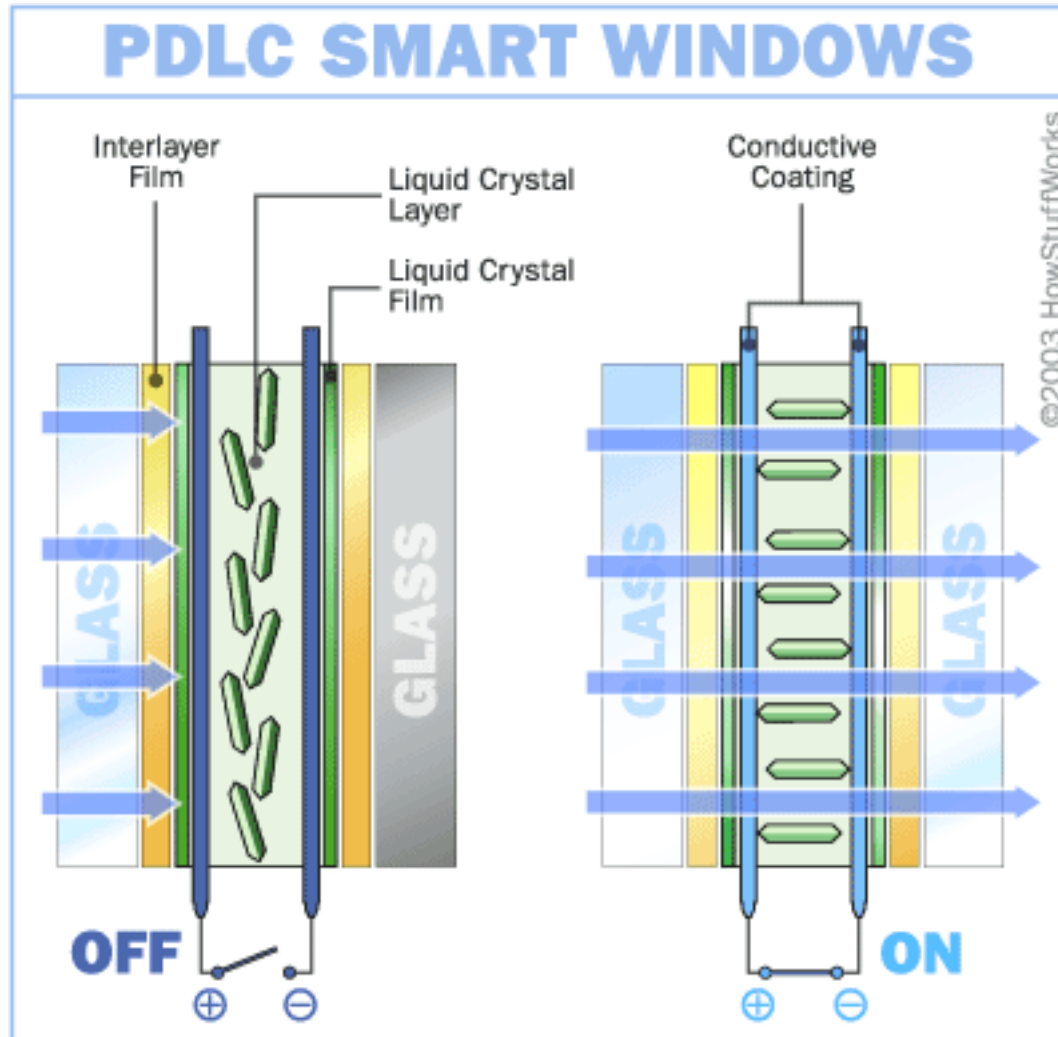
Electric Microgrid



Energy Efficiency

- Intelligent Efficiency
- Thermal loads
- Appliance Efficiency
- Nanotechnology materials
- Combined Heat and Power
- Integrative Design

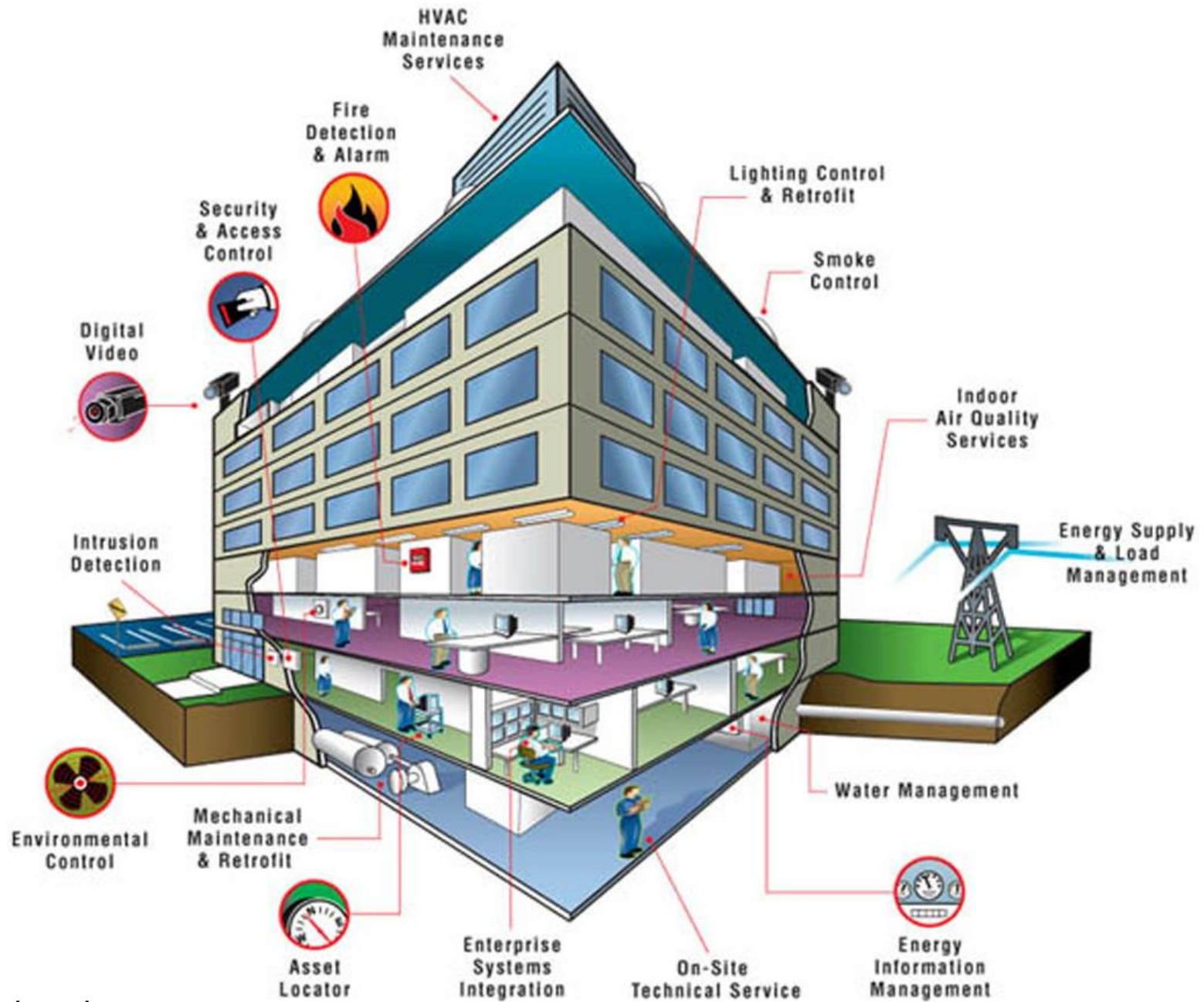
Liquid Crystal Windows

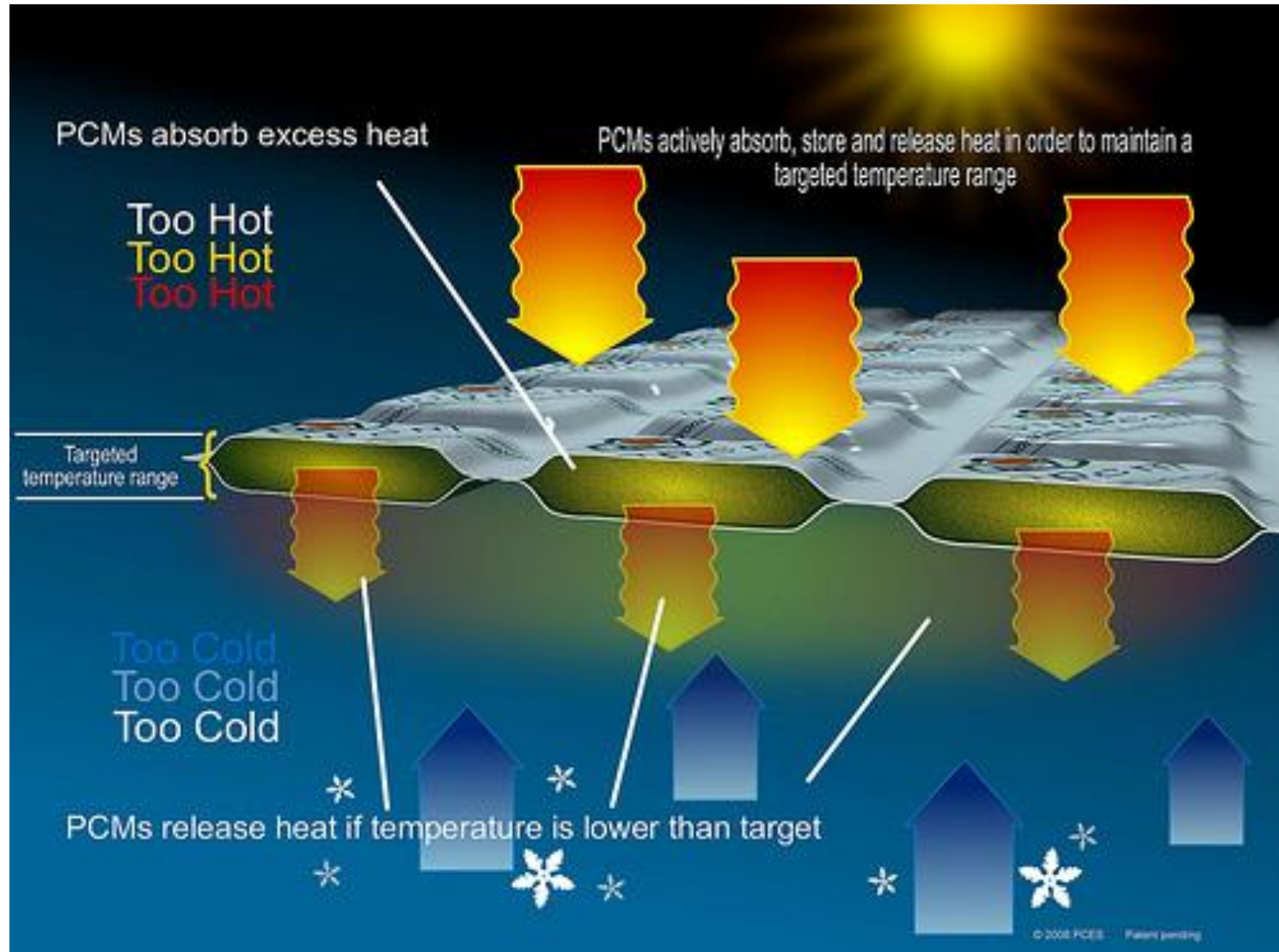


The Nest Learning Thermostat

Programs itself.

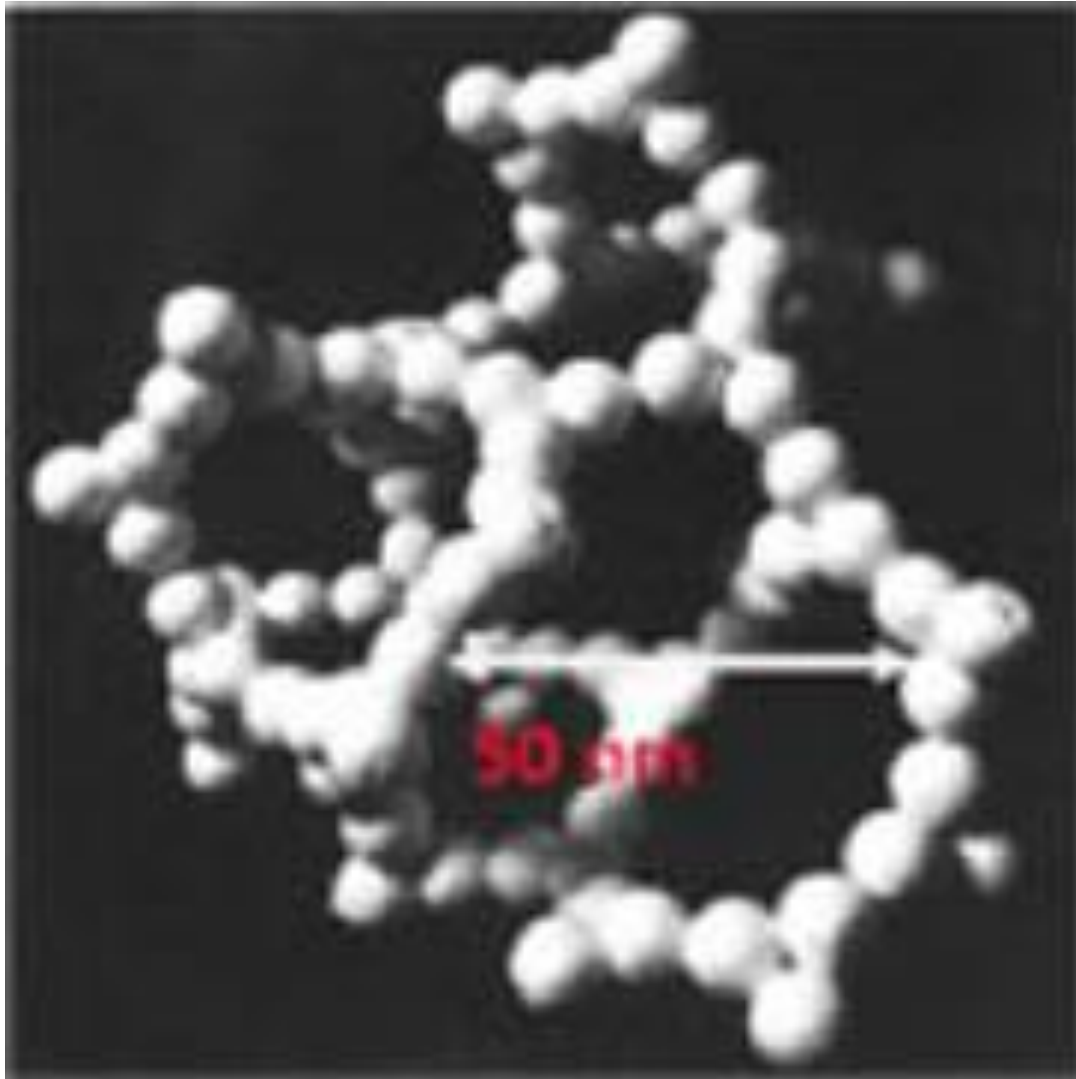






PHASECHANGE Energy Solutions

Nanopore Insulation





Lovins – Reinventing Fire 2011

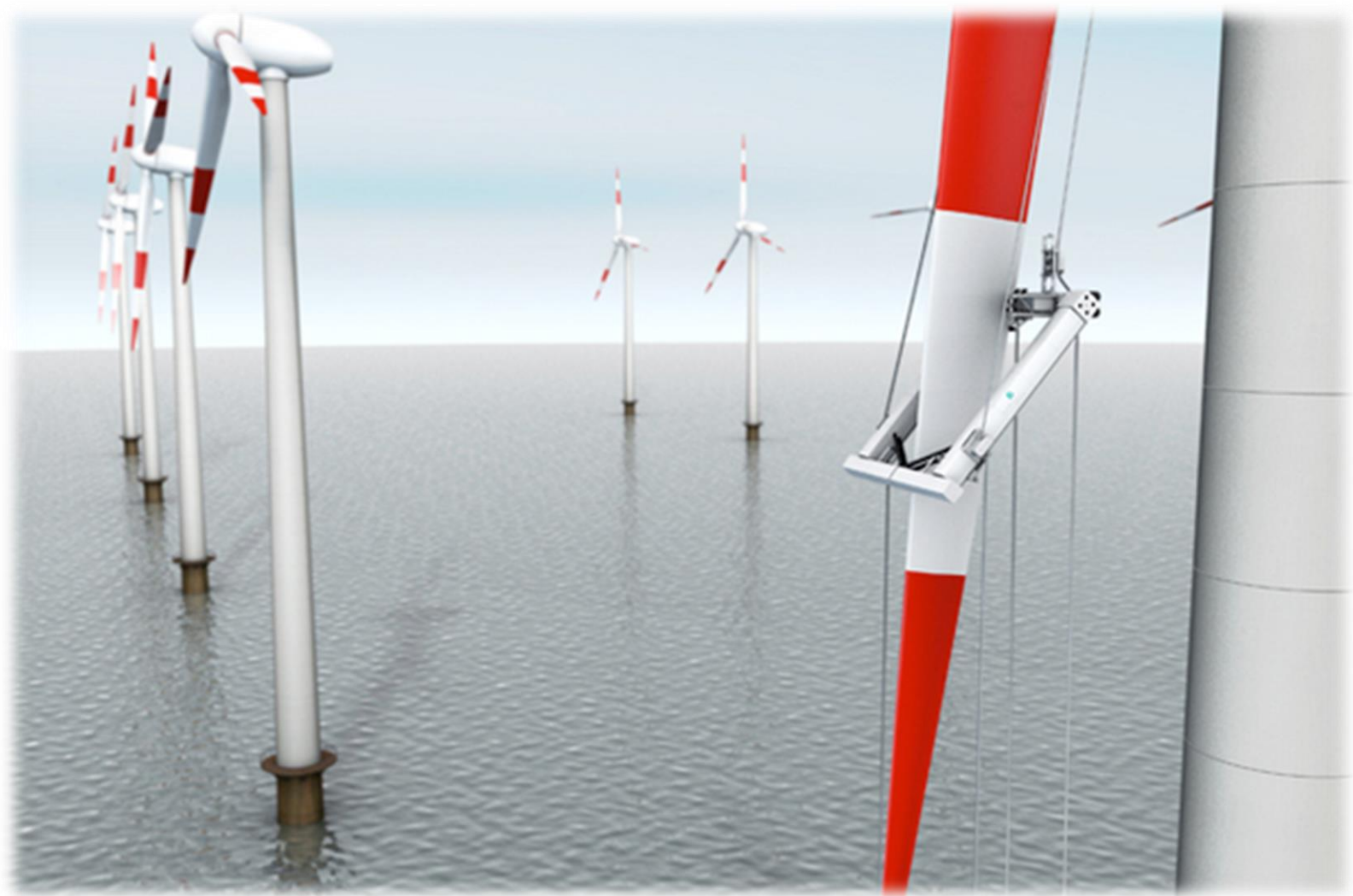
Wind

- On-shore – mature tech – not much tech change and cost reduction
- Off-shore – currently 50-100% higher total lcoe reductions in anchoring and transmission
- Turbines will become even larger
- Stratospheric wind potential
- Low-power wind on buildings, esp. cities – not great deal of power to be gained
- Great wind potential in Texas

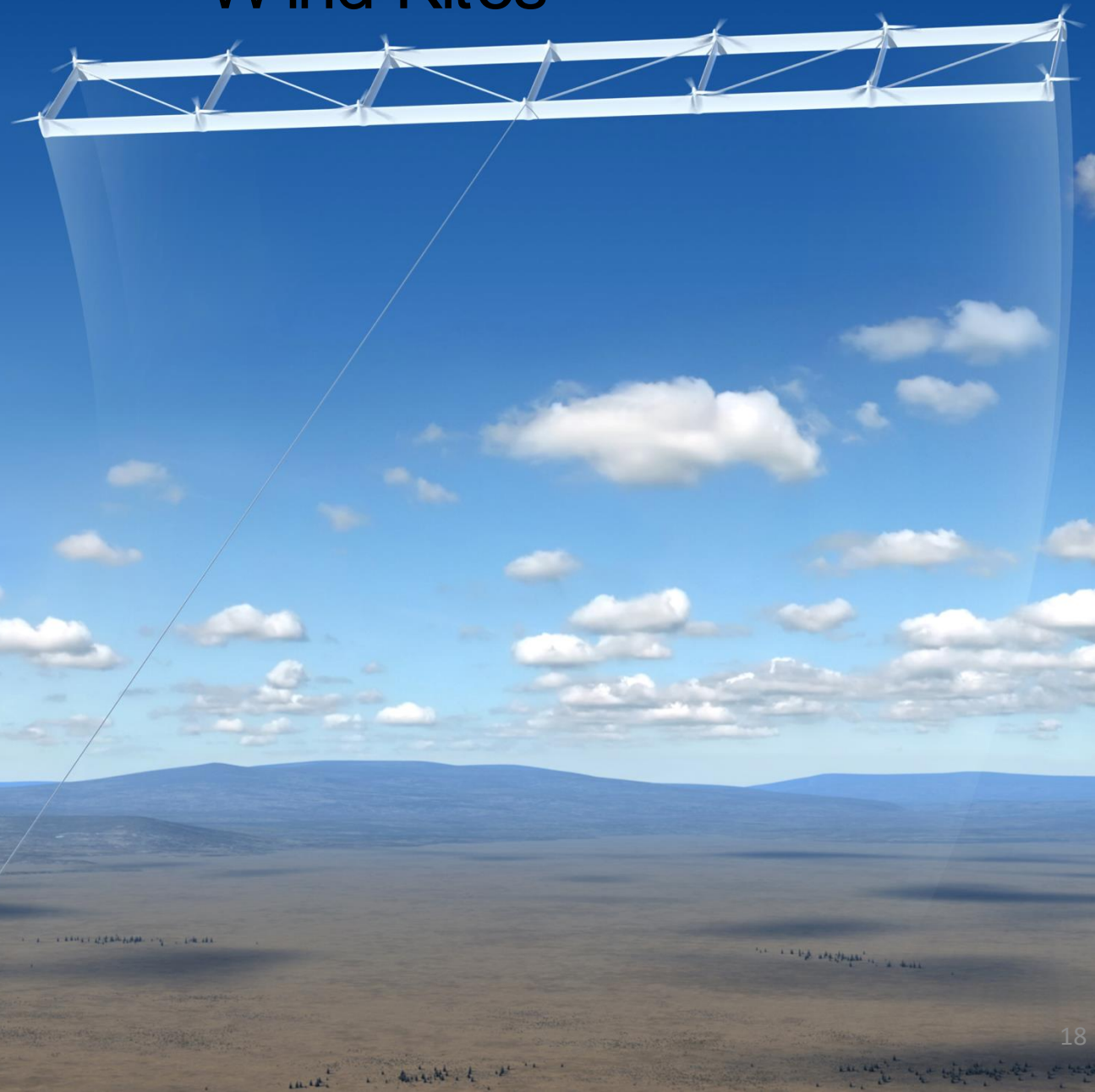
Off-Shore Wind







Wind Kites





The Home Energy Solution

by EarthTronics

Bringing wind technology home.

*Saving money and creating personal
home energy is finally within reach.*





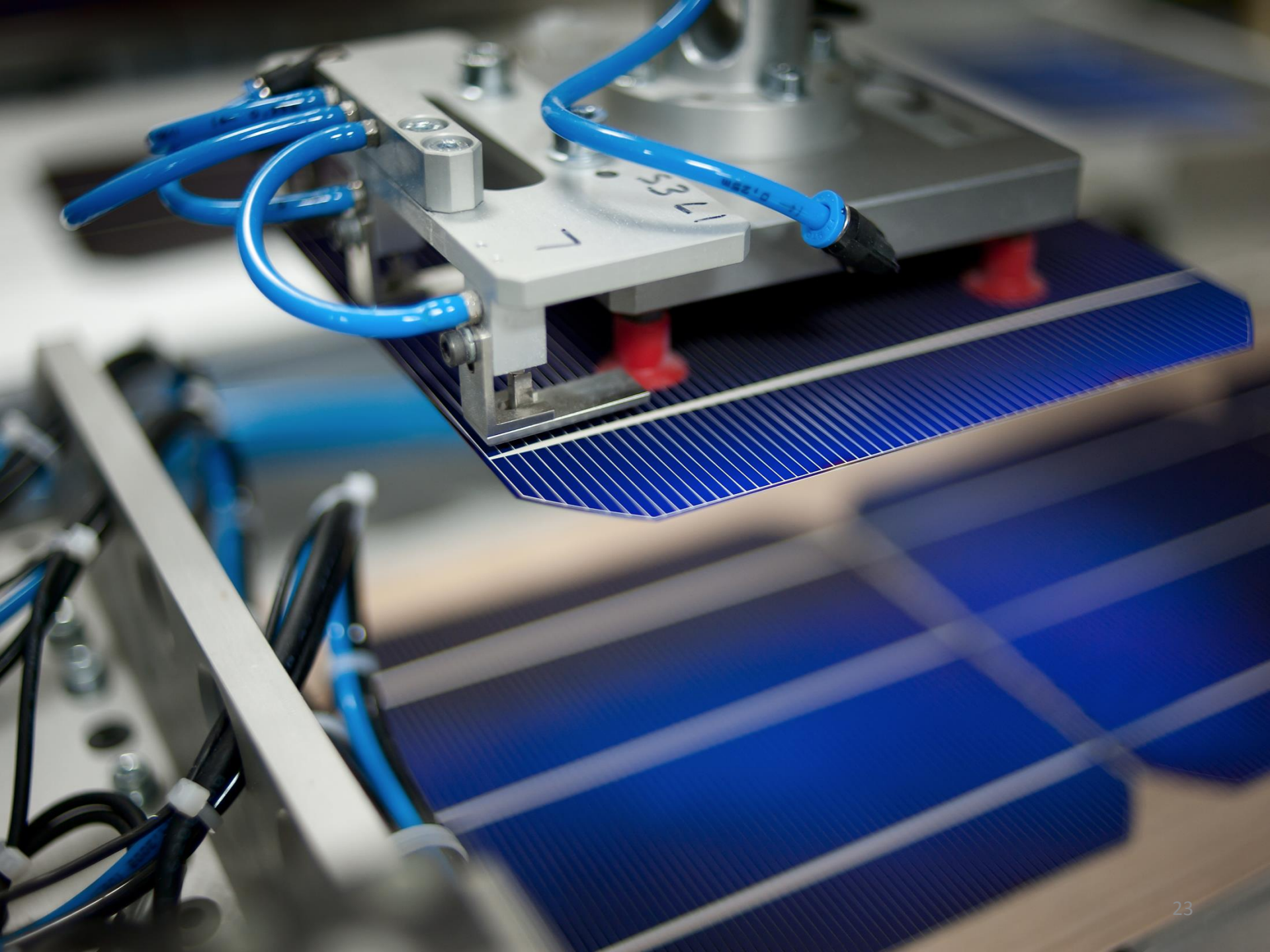
Duncan/Webber
April 8, 2013 20
UT Austin

Solar

- Great expansion of cheap solar seen
- Utility scale solar expansion
- Rooftop distributed
- BIPV
- Ubiquitous mass area applications
- 3-D printing of solar cells?
- Nanotechnology will lead to solar too cheap to meter

Utility Scale Solar









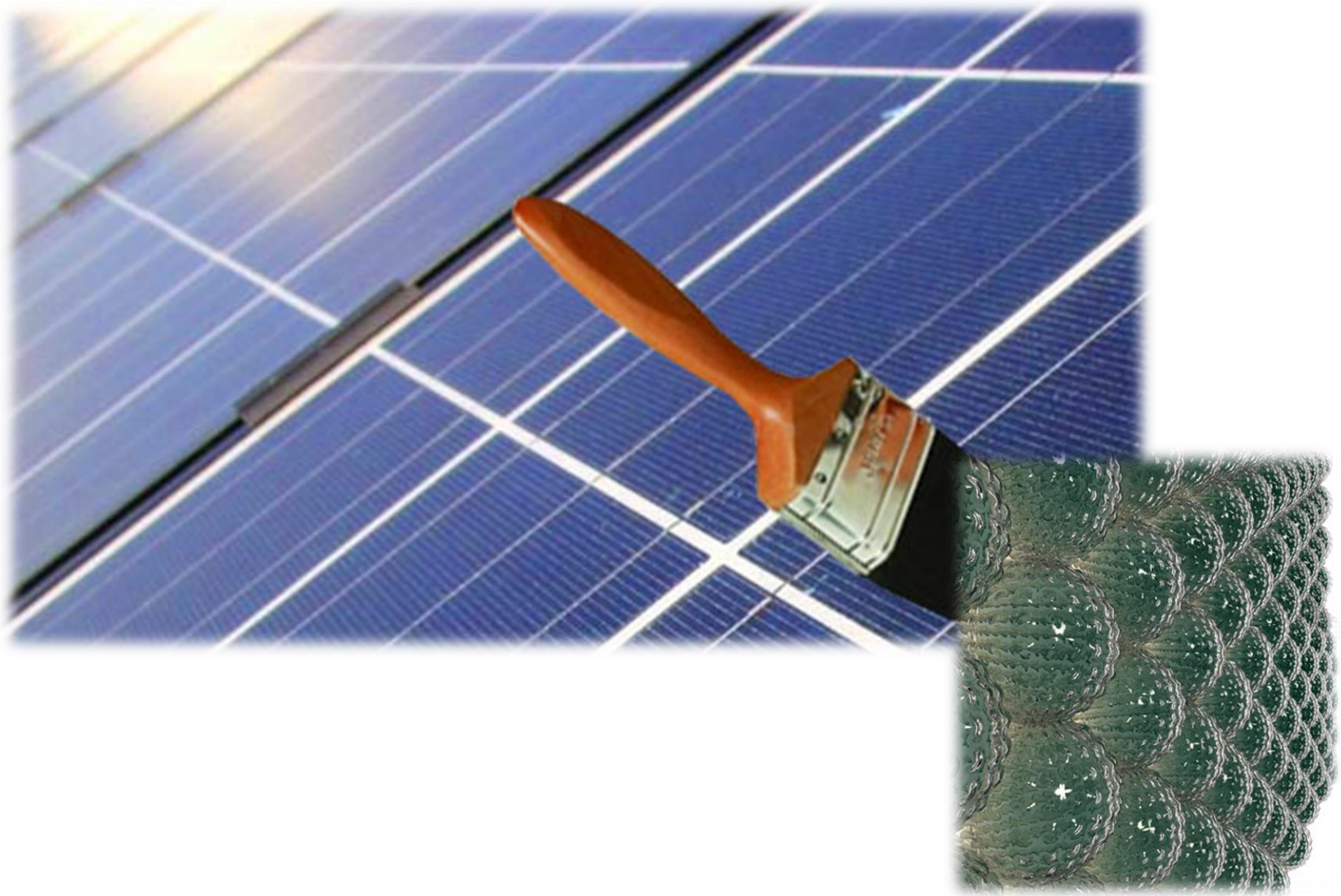
Solar Roof Shingles



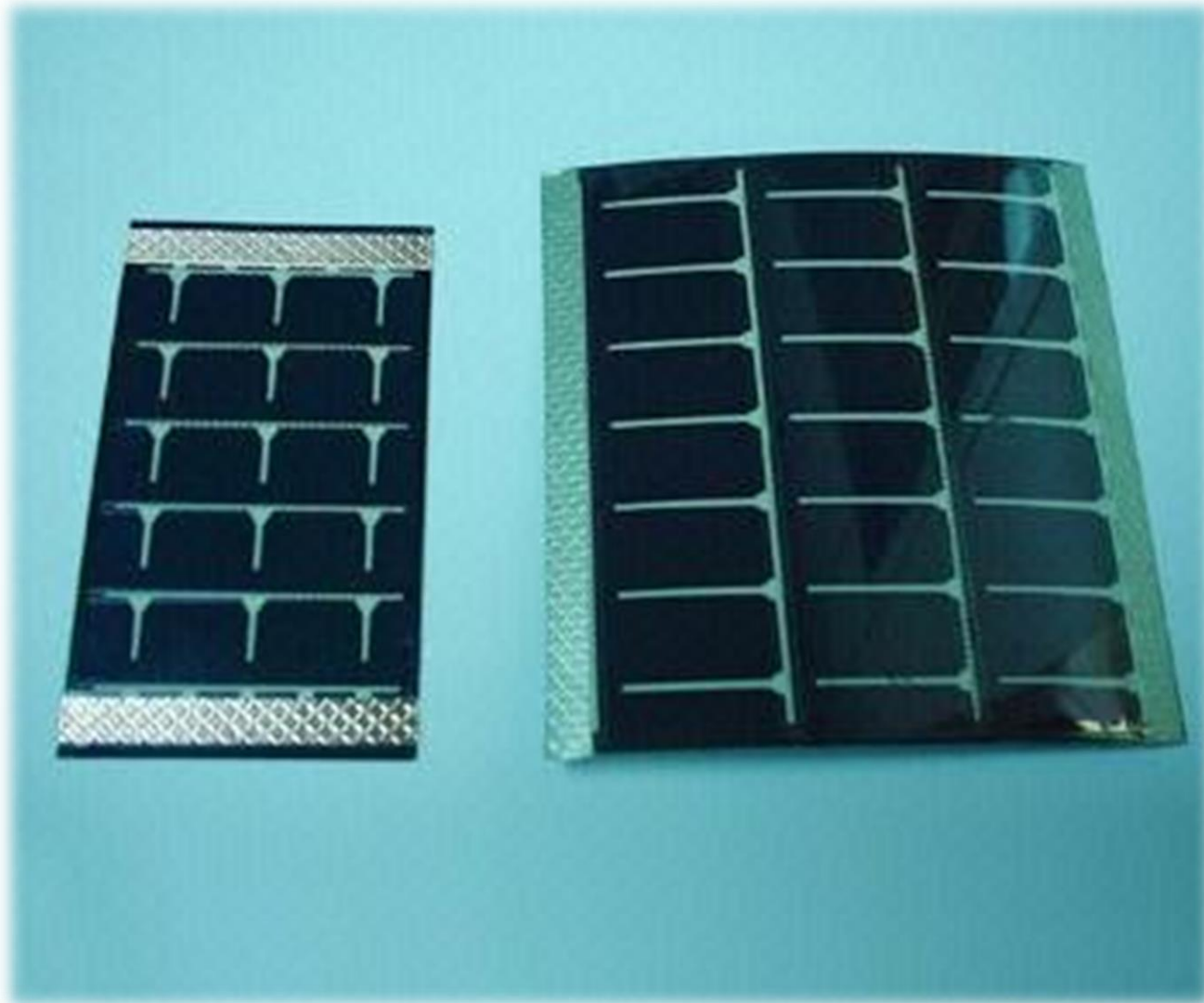
Solar Generating Windows



Solar Paints



Flexible Solar Plastics





SensaLife





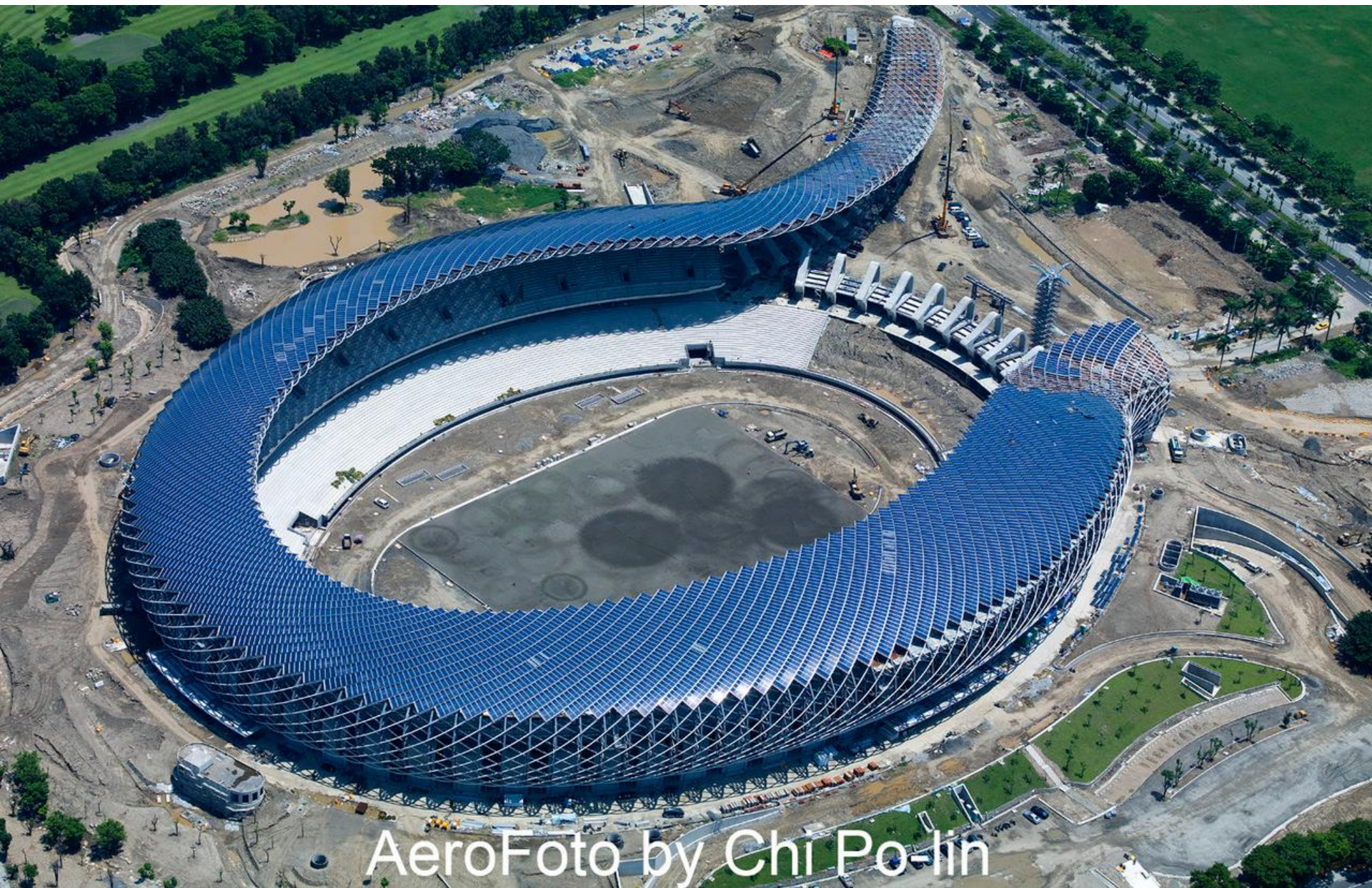
Solar Roads





PHOTO: MICHELLE M CLOUGHLIN / NEWS CAST / NRG

TaiPai Dragon Stadium

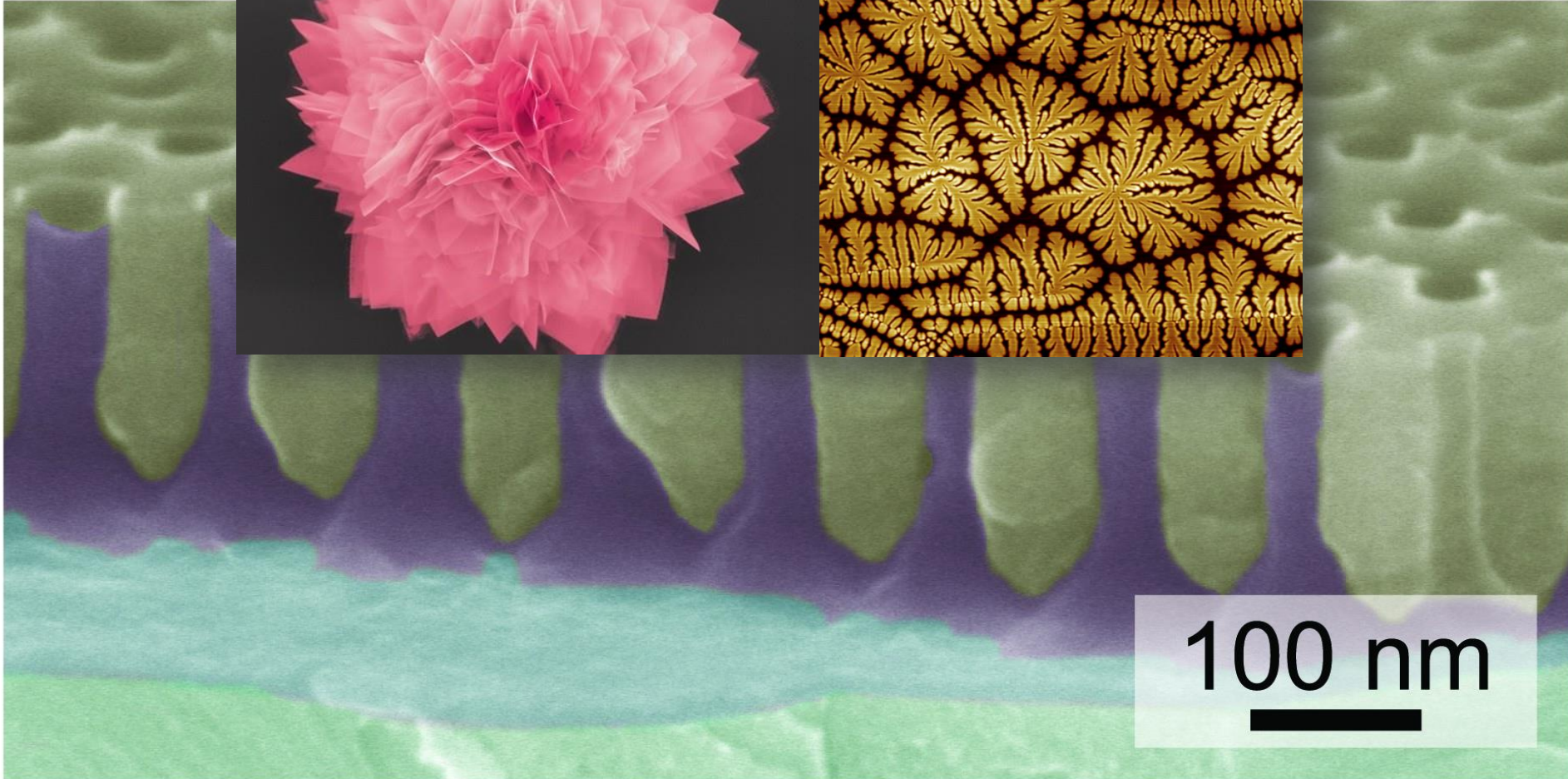
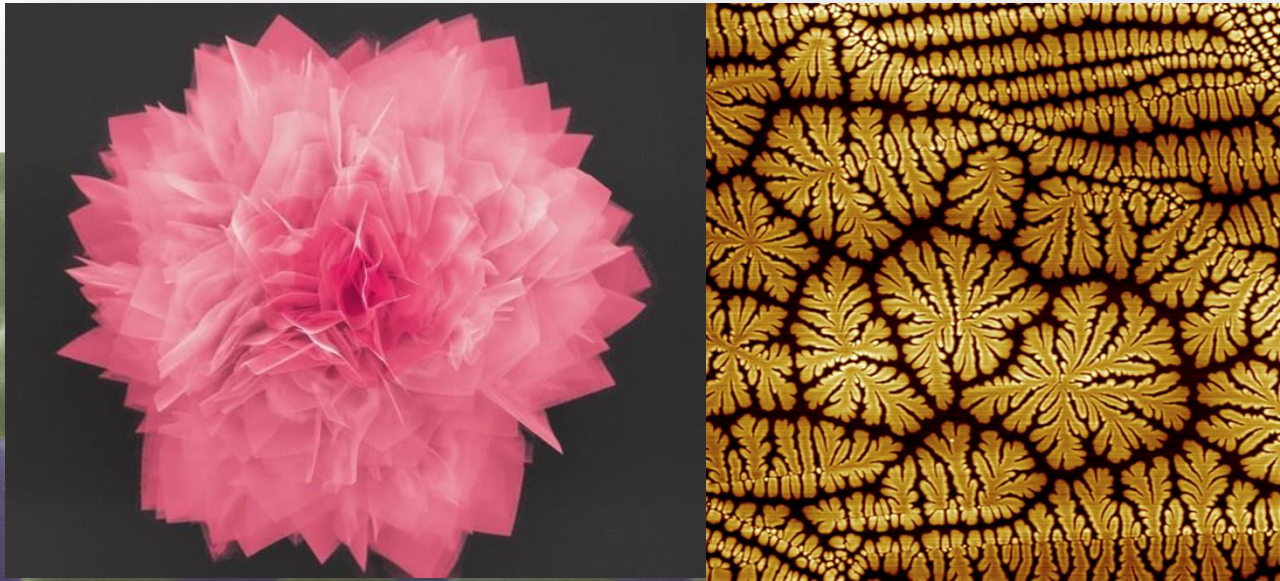


AeroFoto by Chi Po-lin

Solar Trees



Solar Nanoflowers



Nuclear

- Generation 4 reactors – safer
- Small, modular reactors (SMR)
- SMR for desalinization and microgrids
- Cost continues to be main obstacle

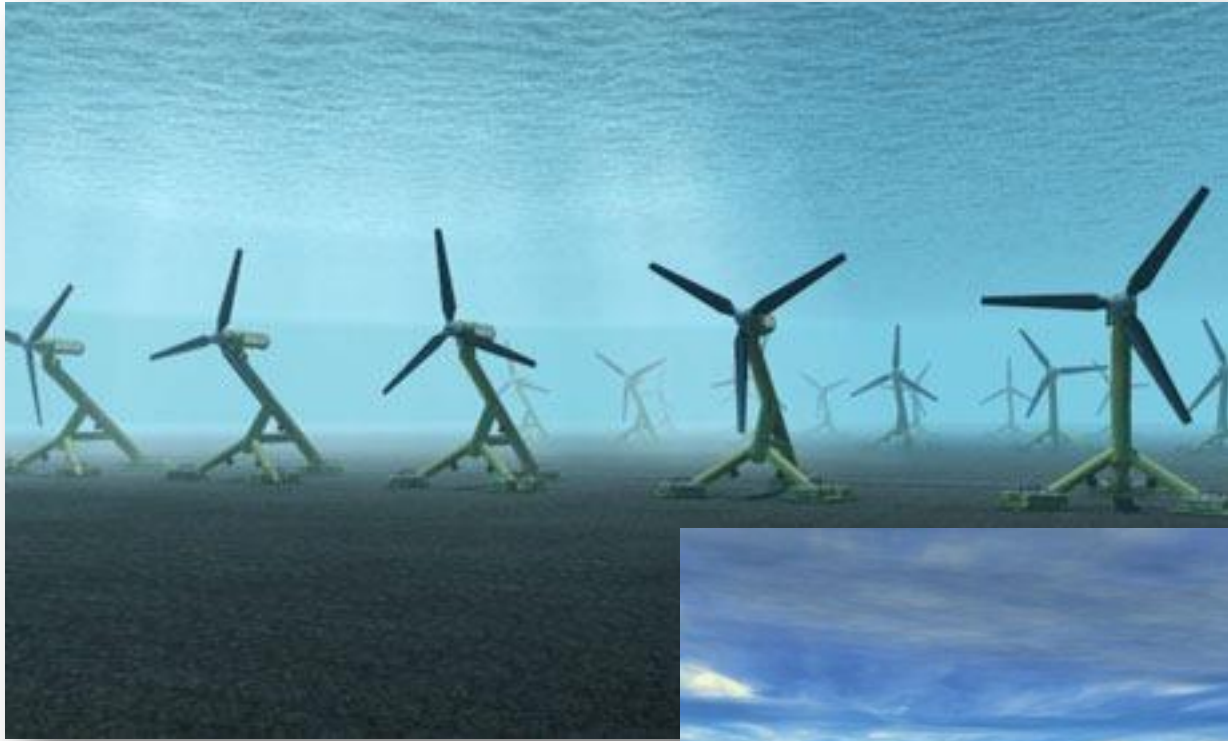
Fossil Fuels

- Coal – Carbon Capture and Storage – expense and plant energy consumption – slow in development
- Gas – no major new technology advances seen
- Oil – deepwater drilling and synthetic production from organic sources - algae

Microturbines are Small and Modular







Nanotechnology and Energy



Low cost solar cells



Hydrogen production from water



Catalysts for clean manufacturing



Solid state lighting



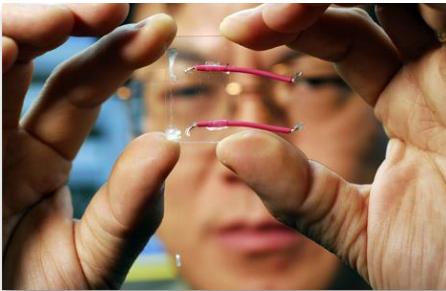
Super strong lightweight materials



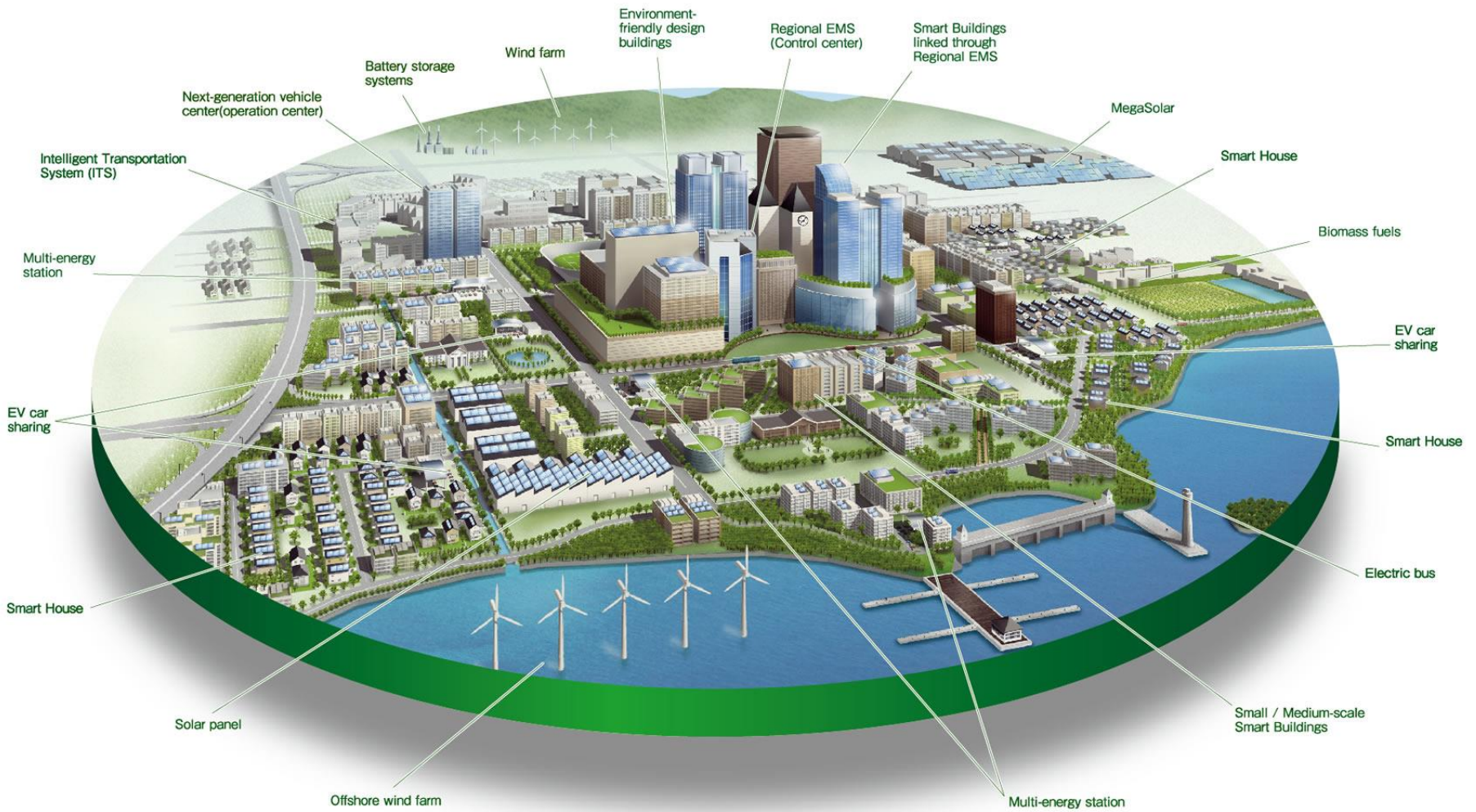
Transmission lines



Energy Storage







Conclusions

- Plenty of emerging energy technology to provide 100% GHG free electricity to Austin by 2050
- Texas has abundant renewable energy resources



QUESTIONS

