



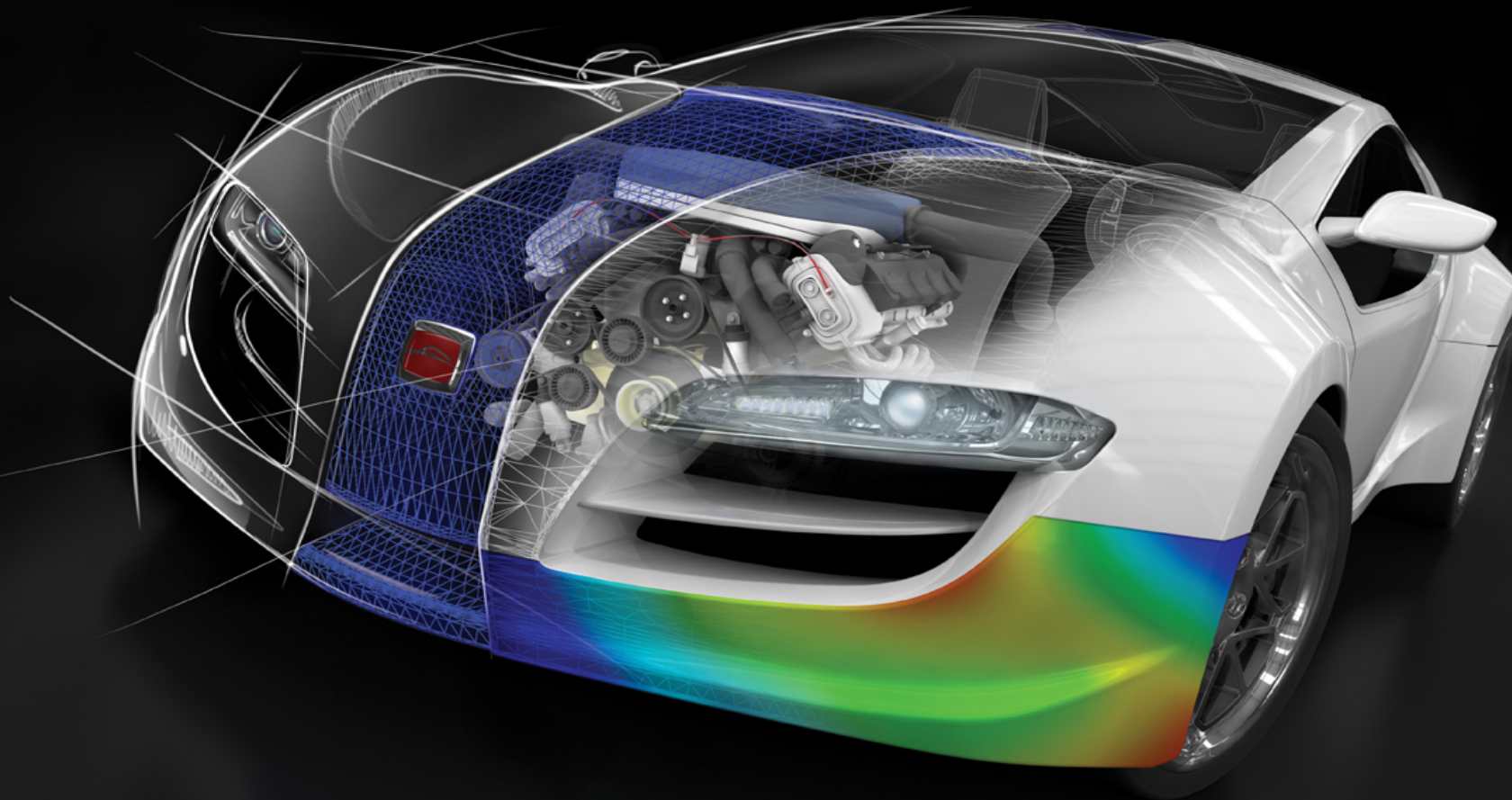
How Design drives Clean Tech Innovation

ECOSUMMIT – November 14, 2012

Paul Cousens

Global Business Development Manager – Clean Technology Industry

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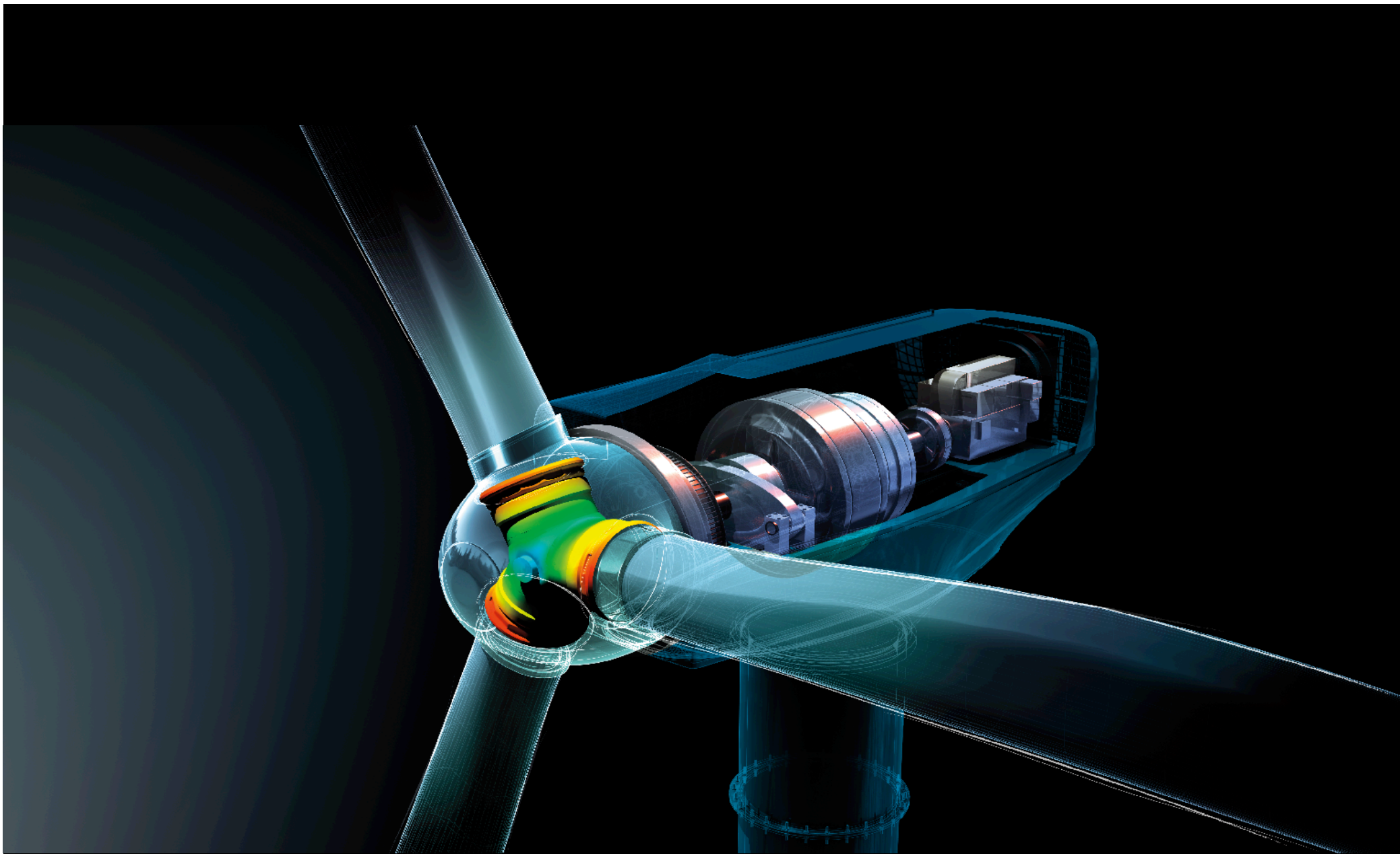
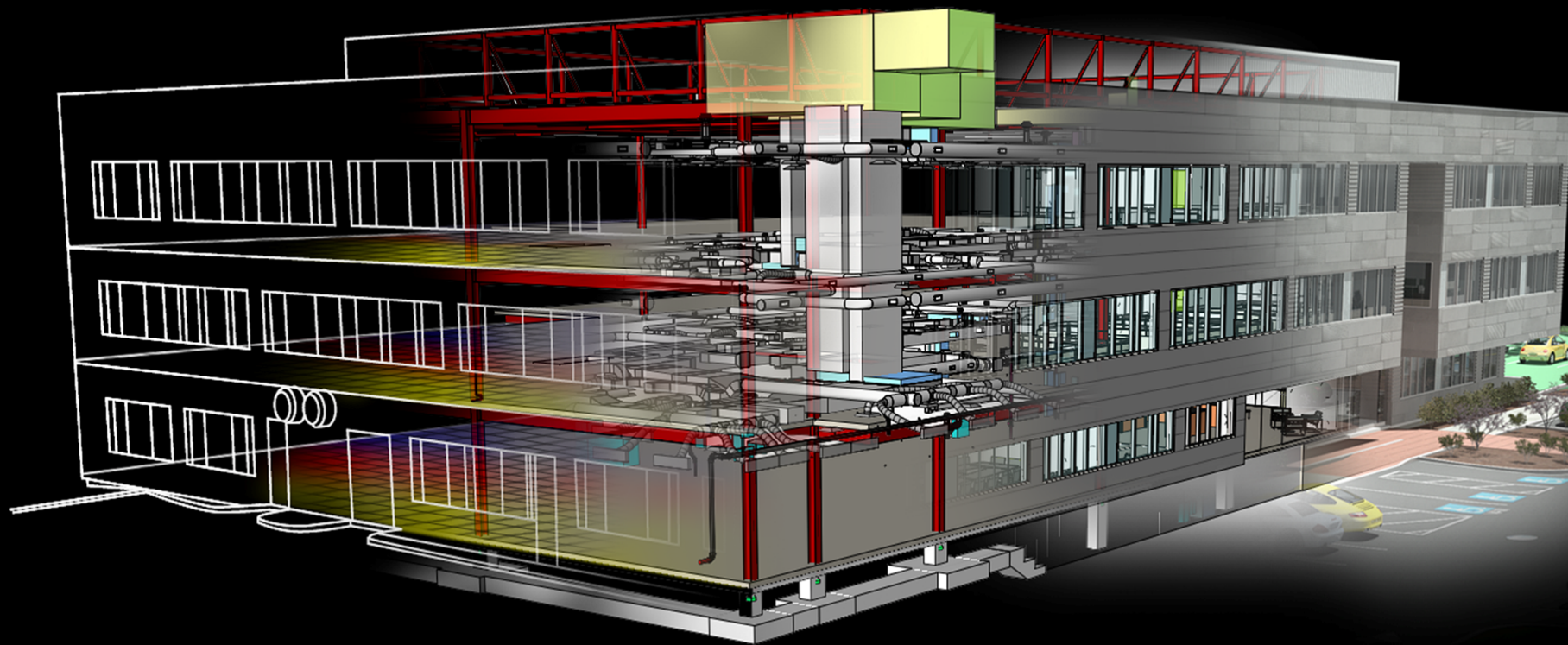


Image Courtesy Lightstorm Entertainment





Summer Solstice

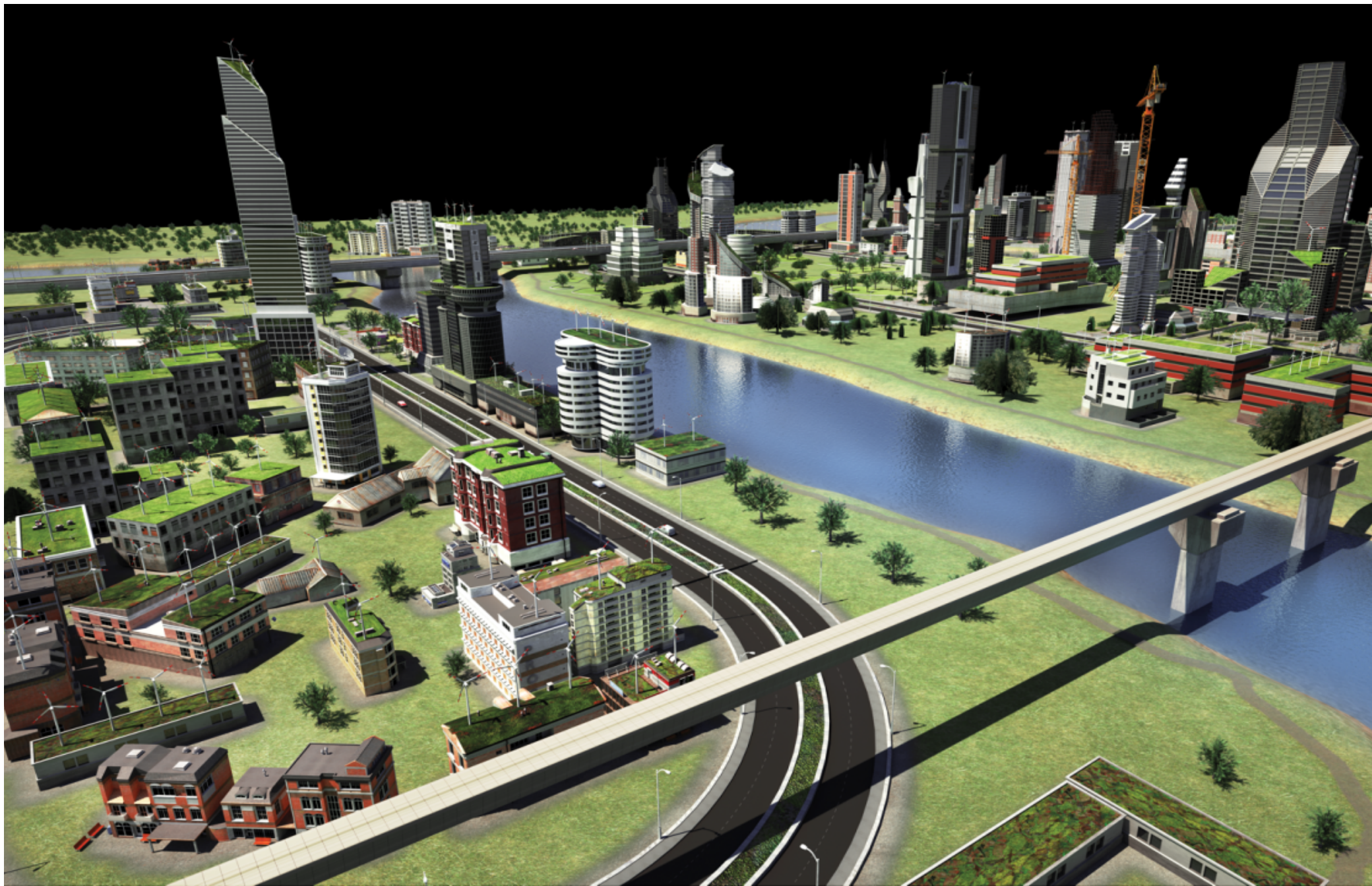


Winter Solstice





Image courtesy of California Academy of Sciences



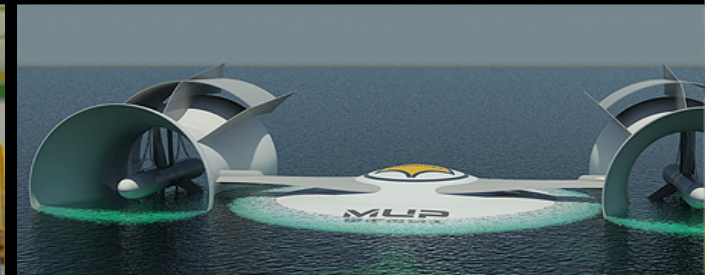
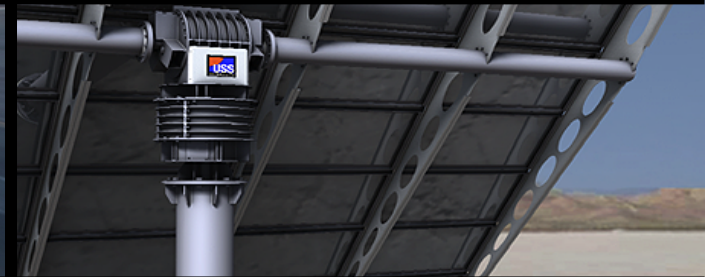
**Design your product's
competitive advantage and
thrive within an established
energy industry**

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Clean Tech Partner



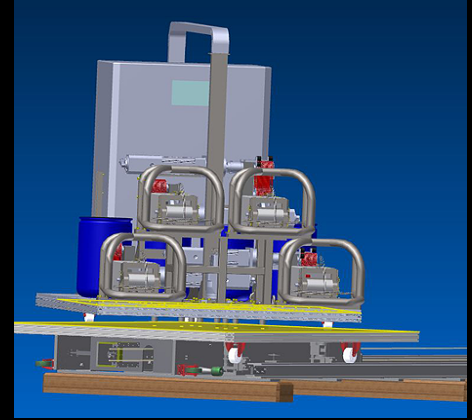
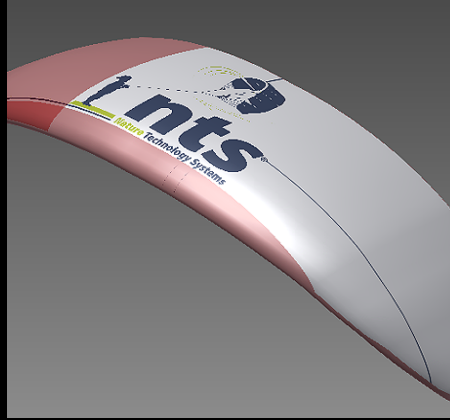
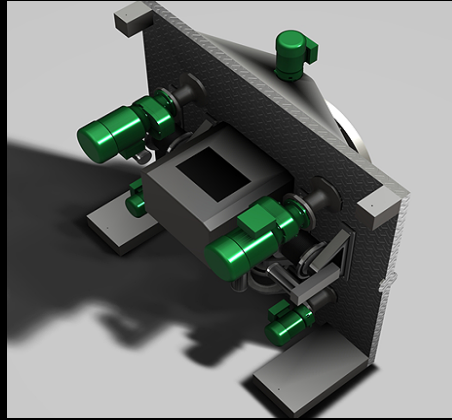
TESLA



Images Courtesy of: APTwater, Tesla Motors, Utility Scale Solar, Inc., Timber Tower, Pyrum Innovations, Poduhvat LTD

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Autodesk



ecoduna produktion-GmbH
Customer Success Story

Autodesk Clean Tech
Autodesk® Inventor®

Before, it used to take us about three weeks to design a new component. With Autodesk Inventor, it takes just two and a half days to make the same item. We can reduce the time required to design these complex components by around 60 to 70%, just by using Inventor.

—Martin Mohr
CEO
ecoduna

Algae: the growth of green power.

ecoduna has developed and patented the world's first photobioreactor for continuous algae cultivation. The company is supported by the Autodesk Clean Tech Partner Programme.



Image courtesy of ecoduna.

Microalgae are a highly promising renewable material. They form the basis for a great many valuable products, with applications ranging from medicine and nutrition to energy production. Several years ago, two young entrepreneurs, Martin Mohr and Franz Emminger, recognised this potential and founded a company to develop it: ecoduna. Based in the Austrian town of Bruck an der Leitha, ecoduna has developed and patented the world's first photobioreactor for the continuous cultivation of microalgae. "We've been working in this area for about six years now. We founded the company in 2009 purely as a vehicle for developing the photobioreactors," explains Martin Mohr, CEO.

Hanging gardens – putting the green in green energy

The green biotech industry is working hard to develop products for industrial applications from these highly versatile organisms. The use of open ponds for industrial-scale cultivation has always been limited by prohibitive energy costs and the enormous volumes of water required. ecoduna has addressed these problems with its "hanging

gardens" concept, a photobioreactor that optimises the conditions for the industrial production of microalgae. It is a continuous system in which the cultivation process and the entire lifecycle of the micro-organisms can be fully managed and the plant serviced without interruption.

The hanging garden systems consist of several vertical panels, each six metres high, in which the microalgae are circulated in fresh water. These conditions are particularly good for the mass cultivation of algae as they produce large yields from a relatively small footprint. The nutrient liquid is transported through the entire photobioreactor by means of hydrostatic pressure and gas lift effect, so no additional energy is required for a pump system. Another important aspect of the hanging gardens design is the unique geometry of the photobioreactor: the reactor is designed in such a way that the surface hit by sunlight is multiplied. In order to achieve a higher productivity, light is diluted since algae cannot use all the light irradiated. By diluting the light, the irradiation will never be too high for ideal growth. In short, it

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enbreeze GmbH
Customer Success Story

Autodesk Clean Tech
Autodesk® Inventor®
Autodesk® Simulation CFD
AutoCAD® Mechanical

Autodesk software is extremely important for us; without it we wouldn't have been able to develop our ideas to the extent that we have.

—Jan Dabrowski
Founder
enbreeze GmbH

Compact, light, sophisticated – the new generation of small-scale wind turbines.



Image courtesy of enbreeze GmbH.

German company enbreeze develops small-scale wind turbines that are even viable on low-wind sites. The start-up company is supported by Autodesk's Clean Tech Partner Programme.

Wind power is a leading form of renewable energy. It is not only one of the safest and most eco-friendly sources of clean energy, it also has an extremely small environmental footprint and offers almost constant availability. It is hardly surprising, then, that turbines – sometimes forming giant wind farms – are becoming a more and more integral part of our landscape. Yet there is no intrinsic reason why this particular form of renewable energy has to be produced on such a grand scale. As energy prices continue to rise, there is an opportunity for ordinary consumers to contribute to a more sustainable world, and make long-term cash savings in the process. Hence the popularity of domestic wind turbines, which can either be mounted on a rooftop or staid in a garden.

The problem with many of these small-scale systems, however, is that they require high wind speeds in order to operate efficiently and are therefore not suitable for all locations. It was precisely this point that inspired Martin Riedel and Jan Dabrowski to develop a new generation of compact wind turbines. Based in Cologne, Germany, the two young entrepreneurs founded enbreeze GmbH in April 2011 and, in collaboration with the Karlsruhe Institute of Technology and a

number of other research bodies, developed an innovative technology to make small-scale wind turbines a viable proposition in low-wind areas.

High output even at low wind speeds

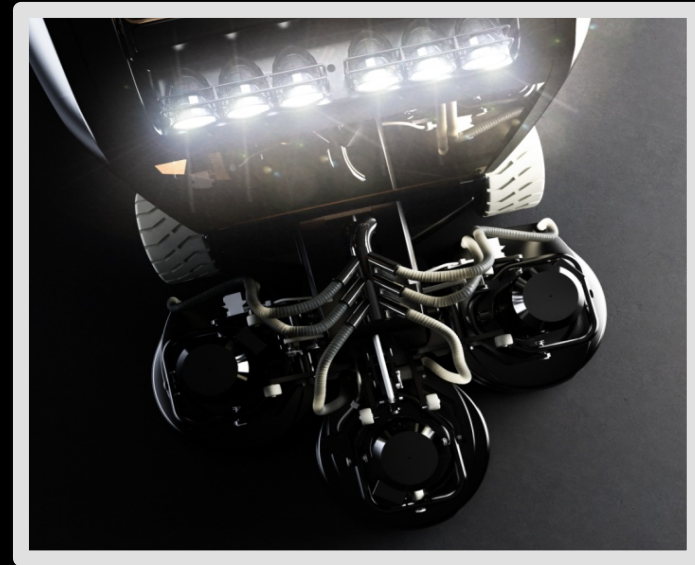
Most conventional wind turbines have a rotor diameter of between 40 and 90 metres. On the enbreeze, it is just 3.5 metres. "Our turbine is compact, light and sophisticated in its design," says enbreeze director, Jan Dabrowski. "Weighing no more than 25 kilos, it can easily be mounted on a domestic rooftop." The unique characteristics of the enbreeze design mean that it can also generate significant amounts of energy in low-wind areas. Riedel and Dabrowski aim to produce a small-scale wind turbine that can be used in any location throughout Germany. They approached the problem by creating a totally new turbine control system. The key feature of the technology is the way the rotor blades can be turned out of the wind when the wind speed reaches a given threshold. "The turbine generates a lot of energy at low wind speeds but if the speed increases above six metres per second, output is automatically capped. Even in high winds and stormy conditions, it produces exactly the same amount of energy as it does at six metres per second. The key advantage of the system is that the loads on the turbine remain the same at all times. As a result, it is possible to make all of the components that much lighter, which in turn provides a crucial cost saving," explains Jan Dabrowski.

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Prototyping



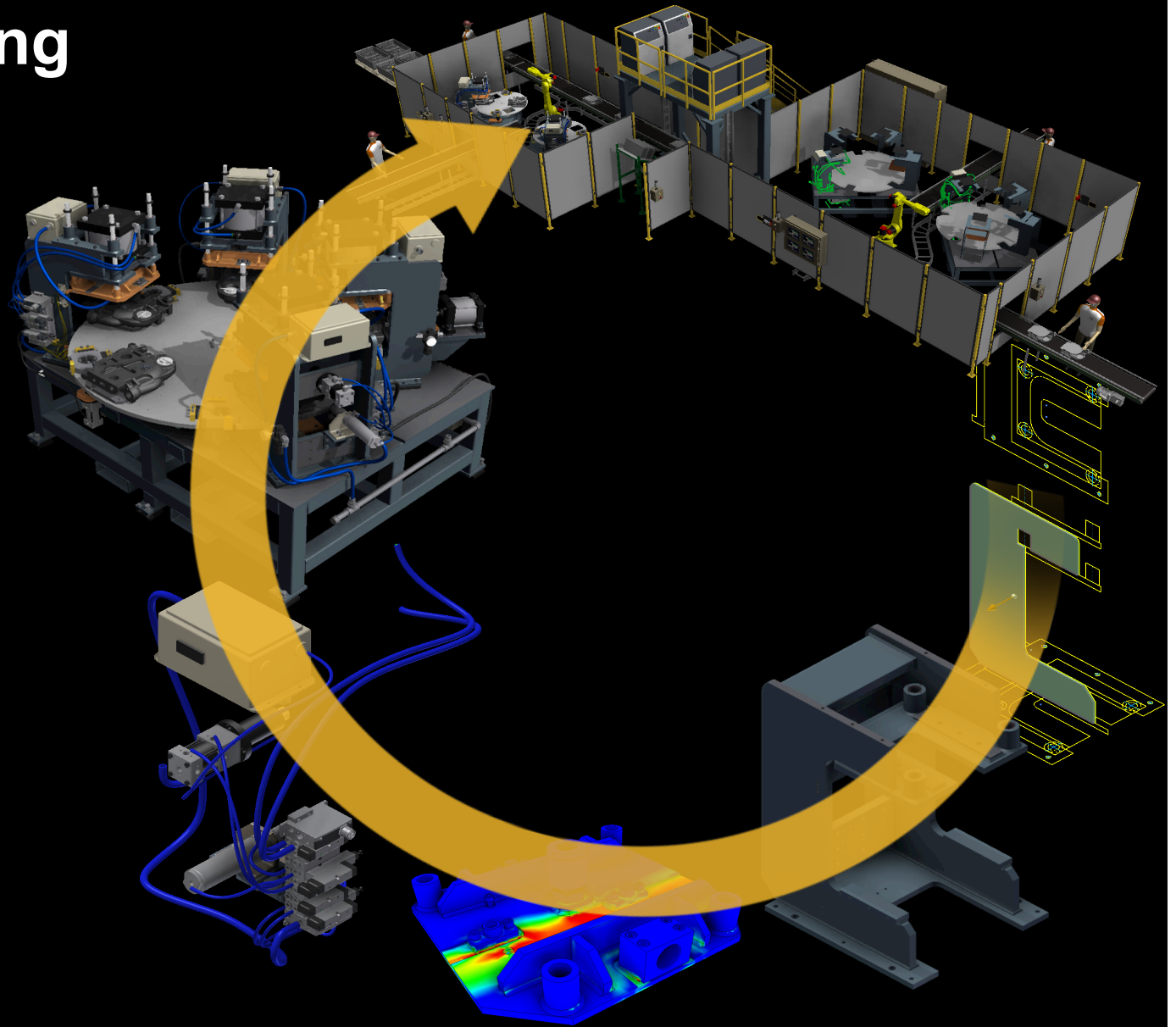
Photograph
\$2.5M
52 weeks
Physical Prototype

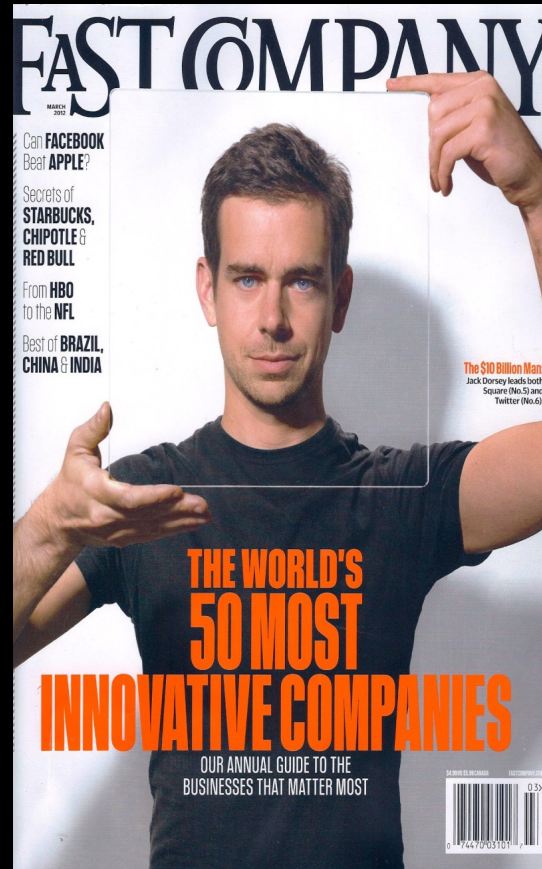


Digital Model
\$75K
12 weeks
Digital Prototype

Digital Prototyping

Digital Prototyping enables users to design, visualize and simulate their products and processes digitally.







Trend 1: Business Un-usual

Pull Mode

Rank: 164 Score: 4277

Soloist 459 (<150): Multi-S... aeruginosa Puzzle

Expires 9/24/2011 9:00 EDT (2 days, 22 hours)

► No bonuses or conditions



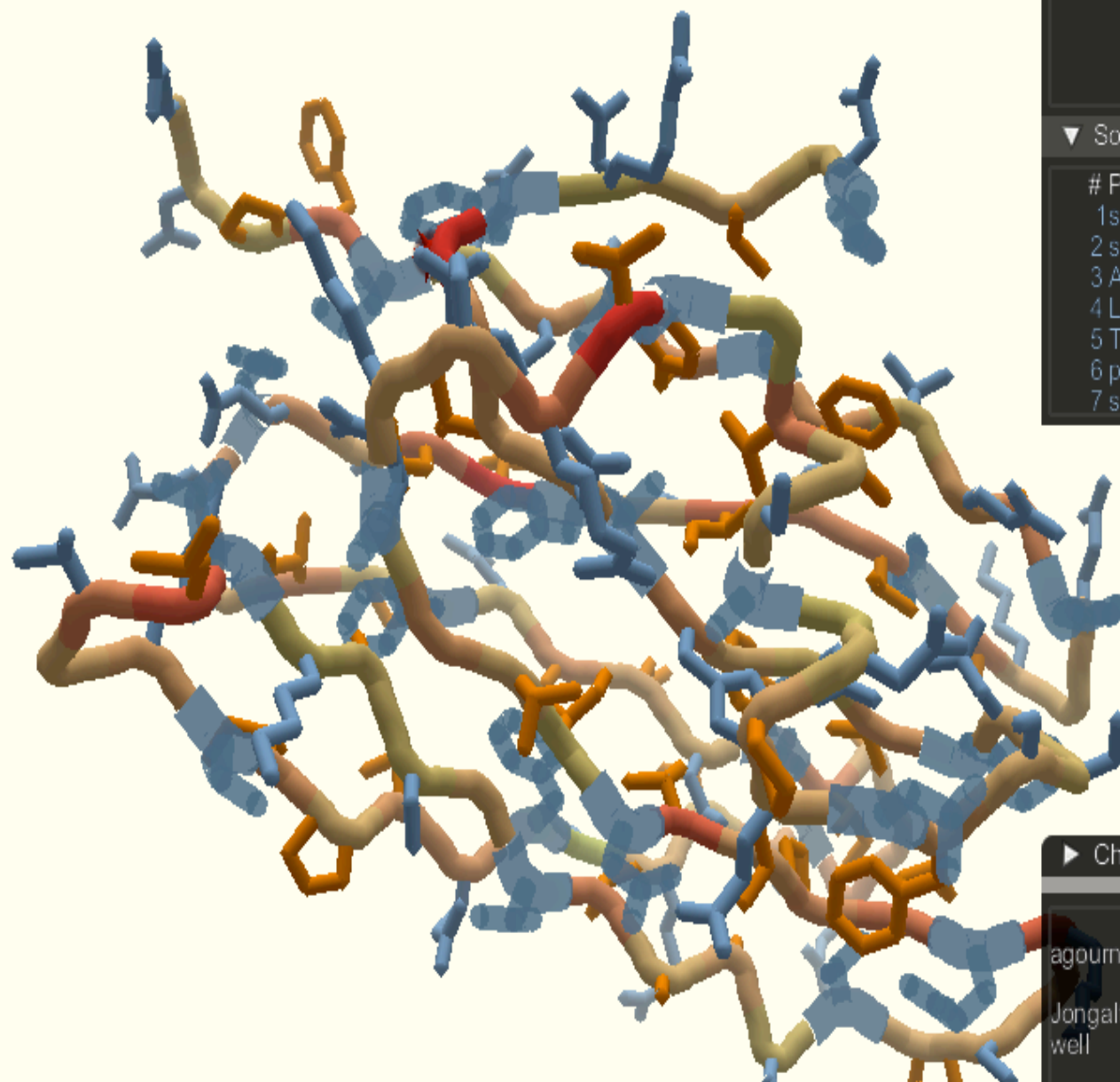
▼ Group Competition

#	Group Name	Score
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▼ Soloist Competition

#	Player Name	Current	Best
1	sweetname2	8904	10581
2	sweetname	10007	10512
3	Atticus.Wolfstein	-	10477
4	LRWerewolf	10445	10460
5	TheOnlyMe	-	10342
6	phoenixfive	-	10301
7	sweetname3	-	10178

▼ Cookbook



► Chat - Puzzle ⓘ ✕ auto show

agourmis: how do I get to the tutorial?

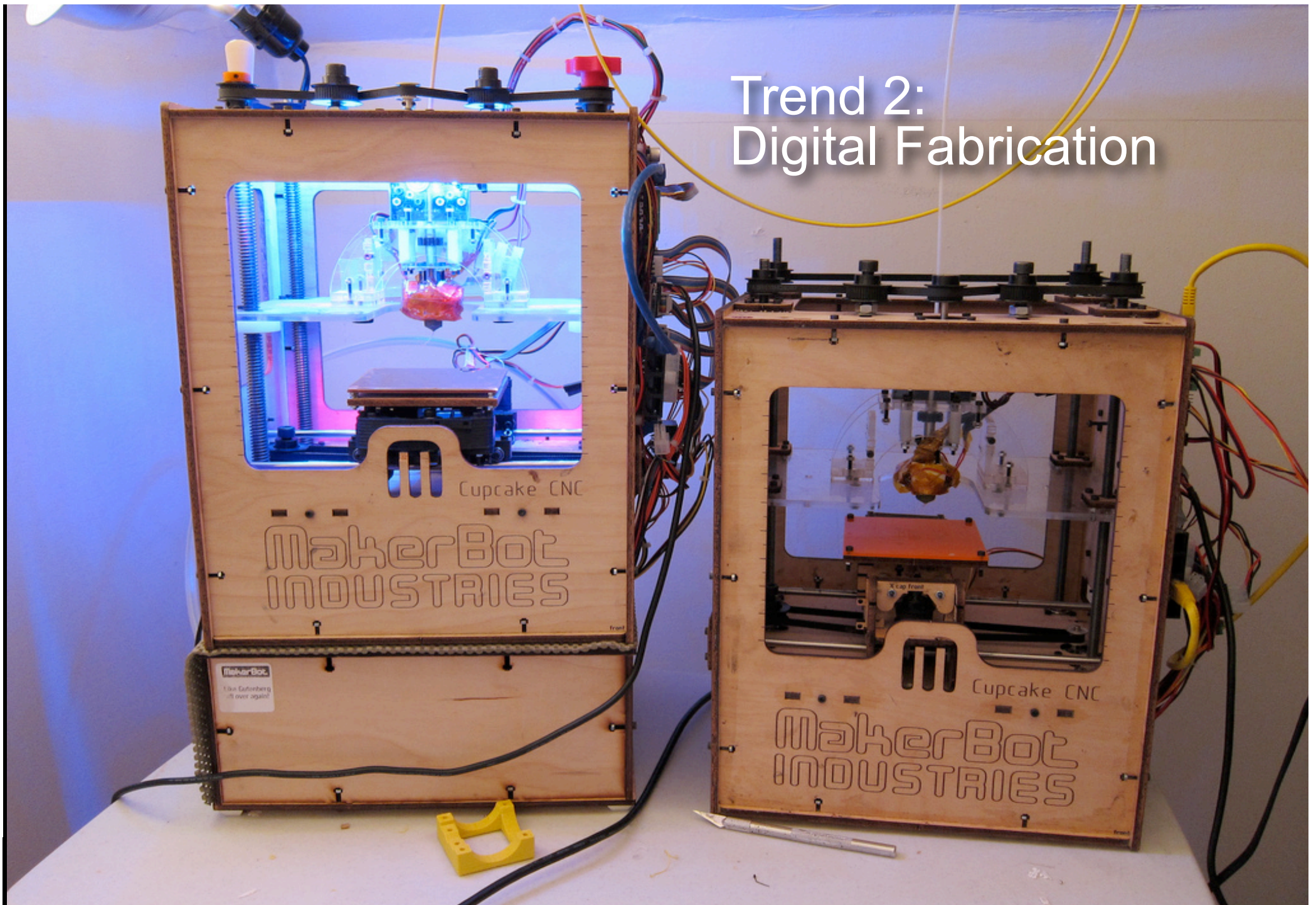
Jongalt26: i have no idea.... just started as well

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Image Courtesy Tesla Motors



Trend 2: Digital Fabrication





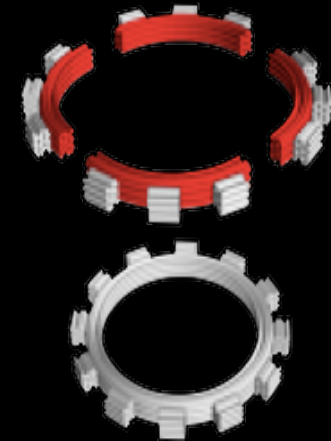
Additive



Subtractive



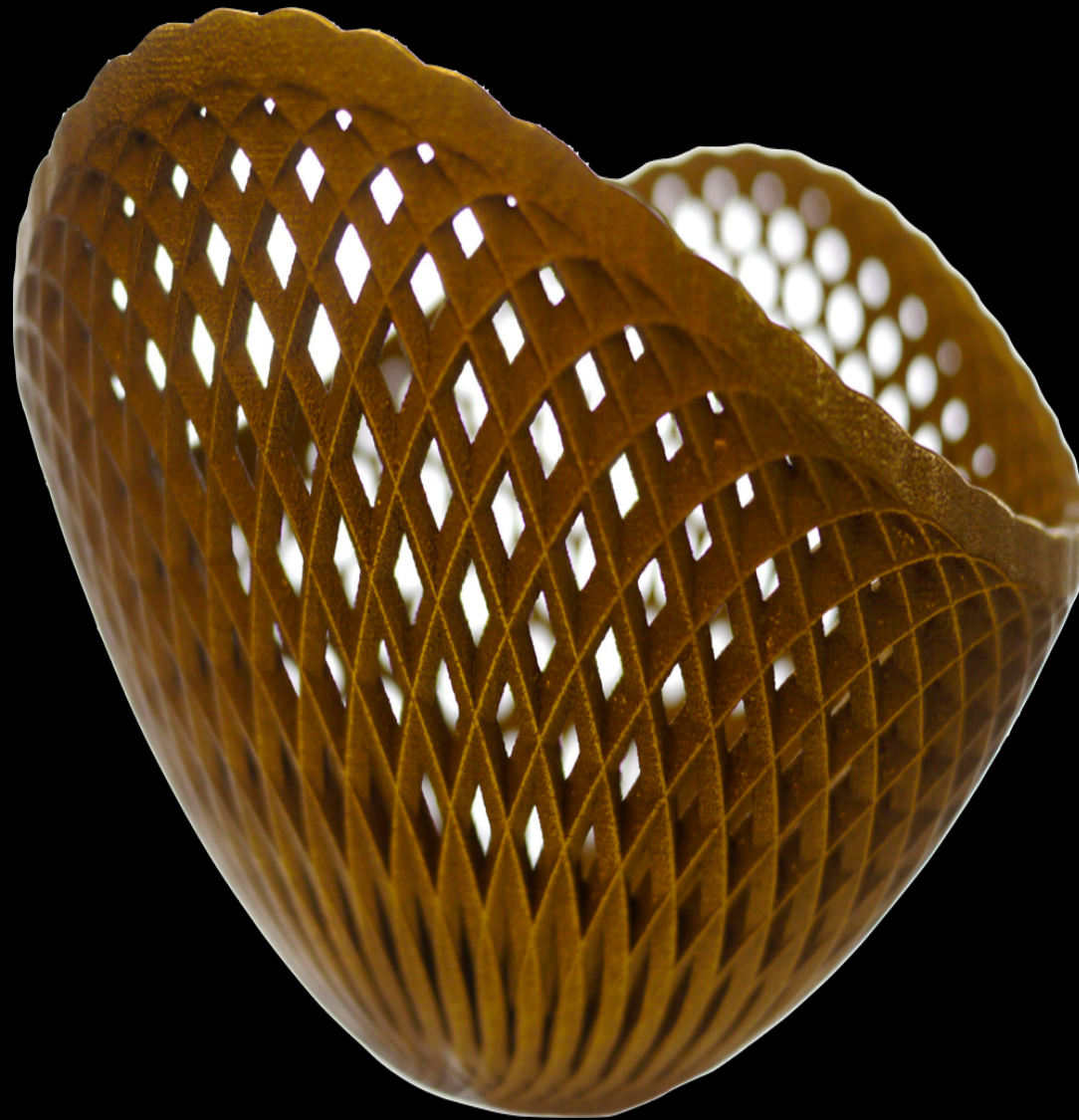
Robotic Assembly

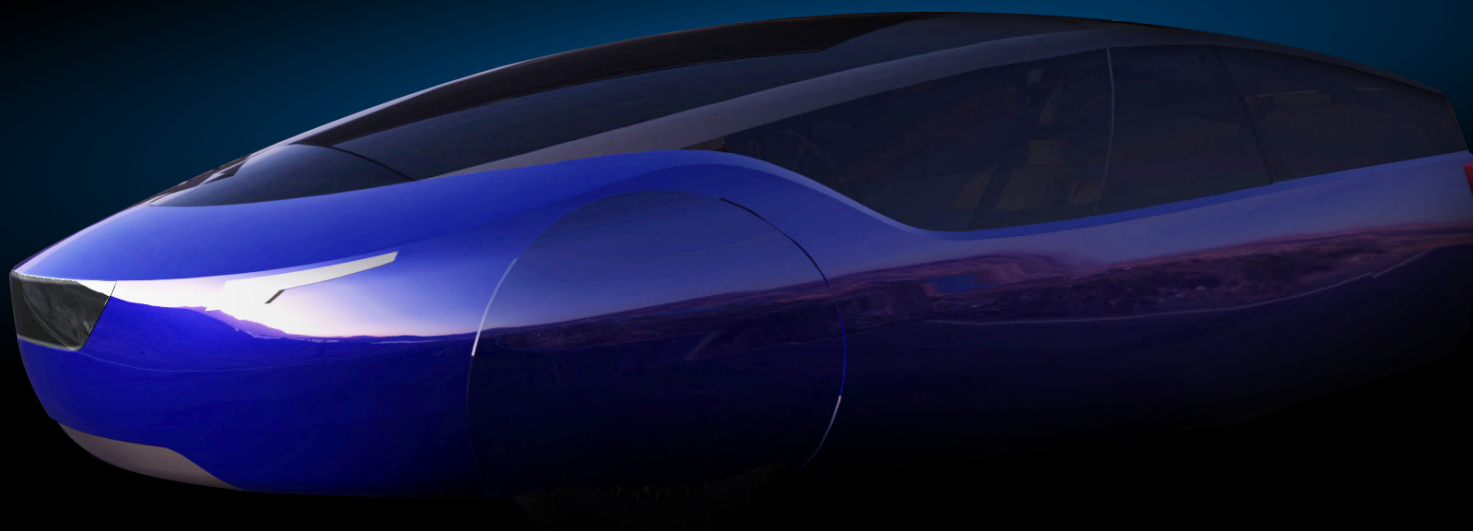


Nanoscale & Bio





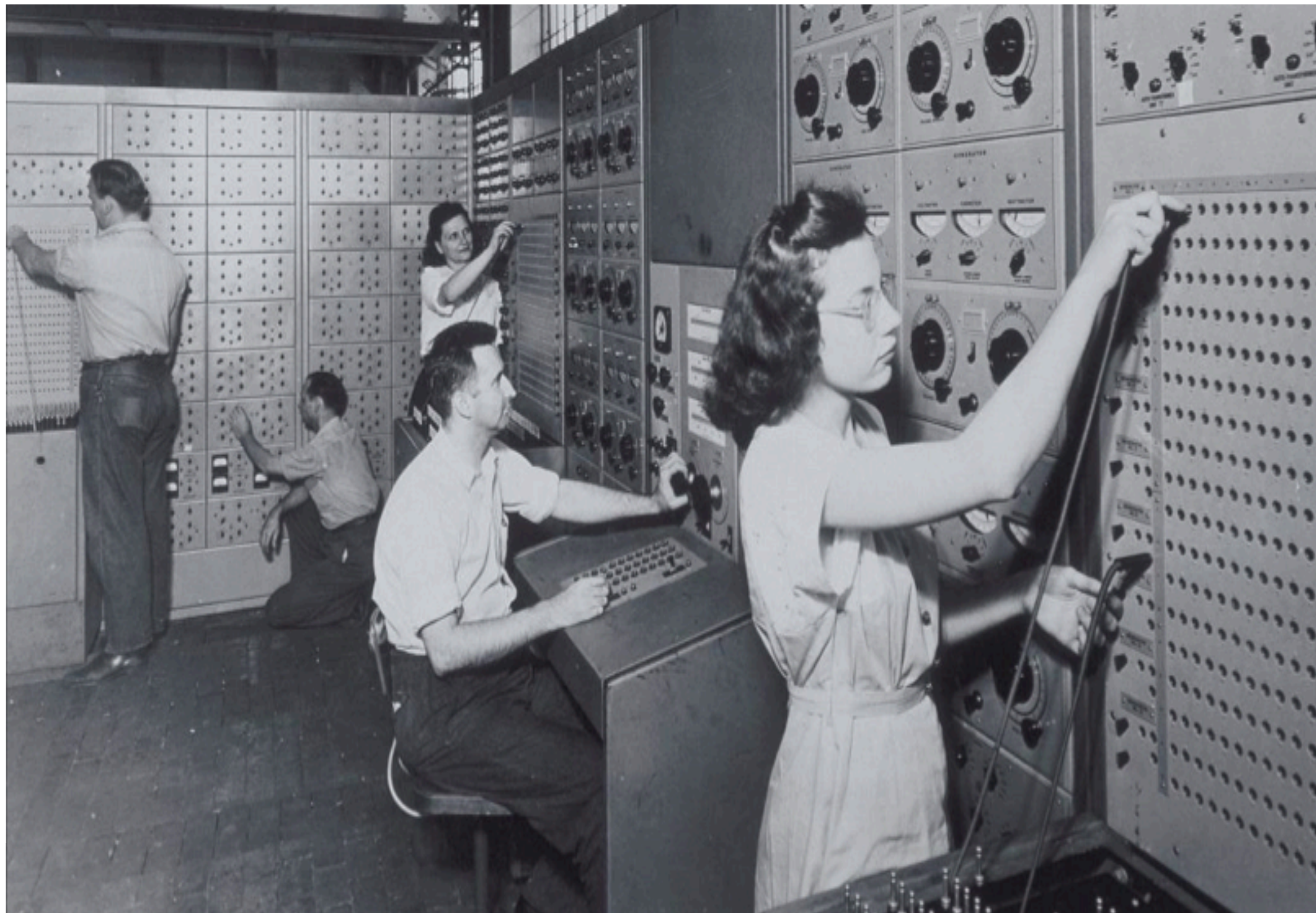




Urbee



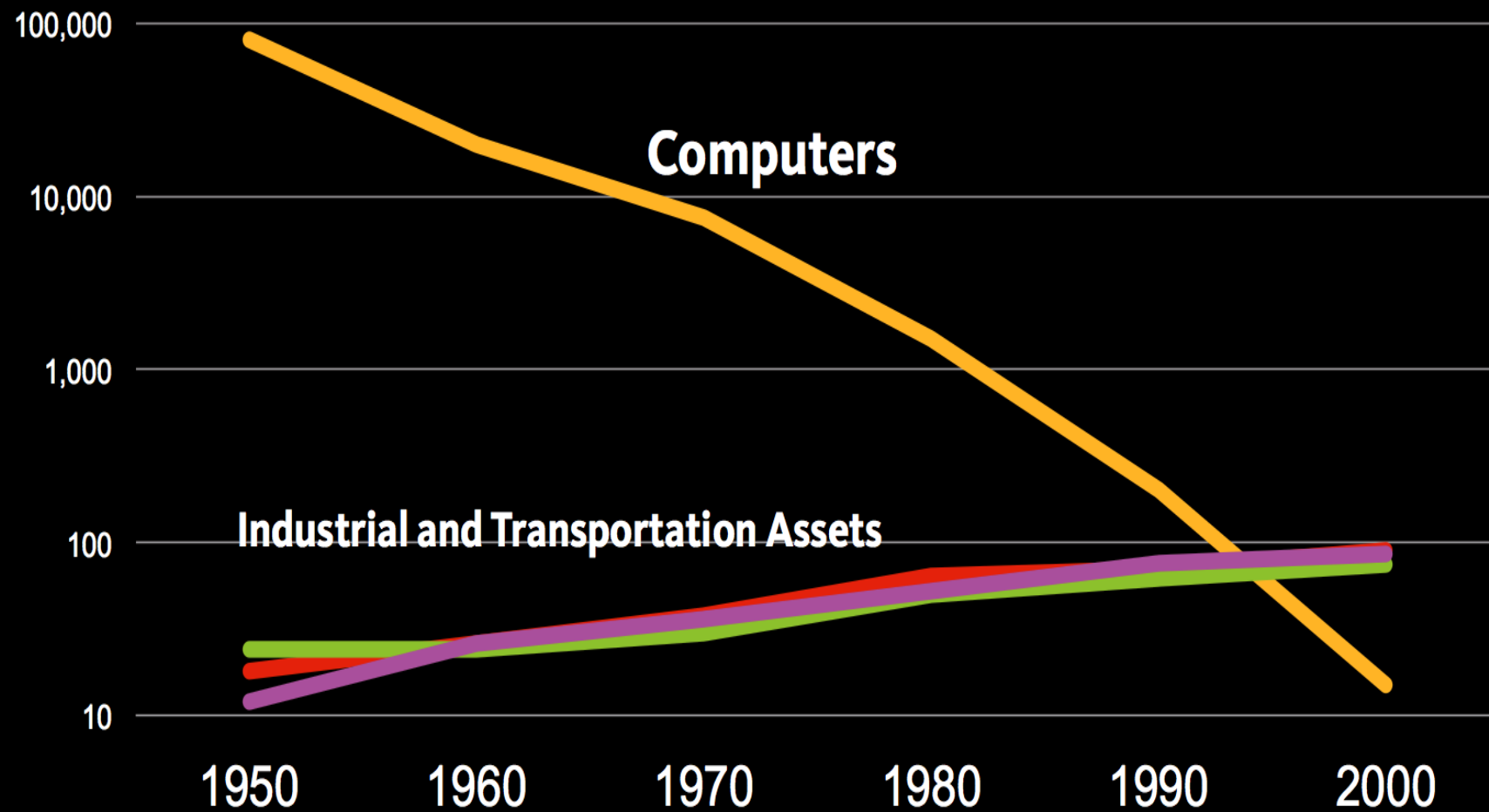
Trend 3: Infinite Computing



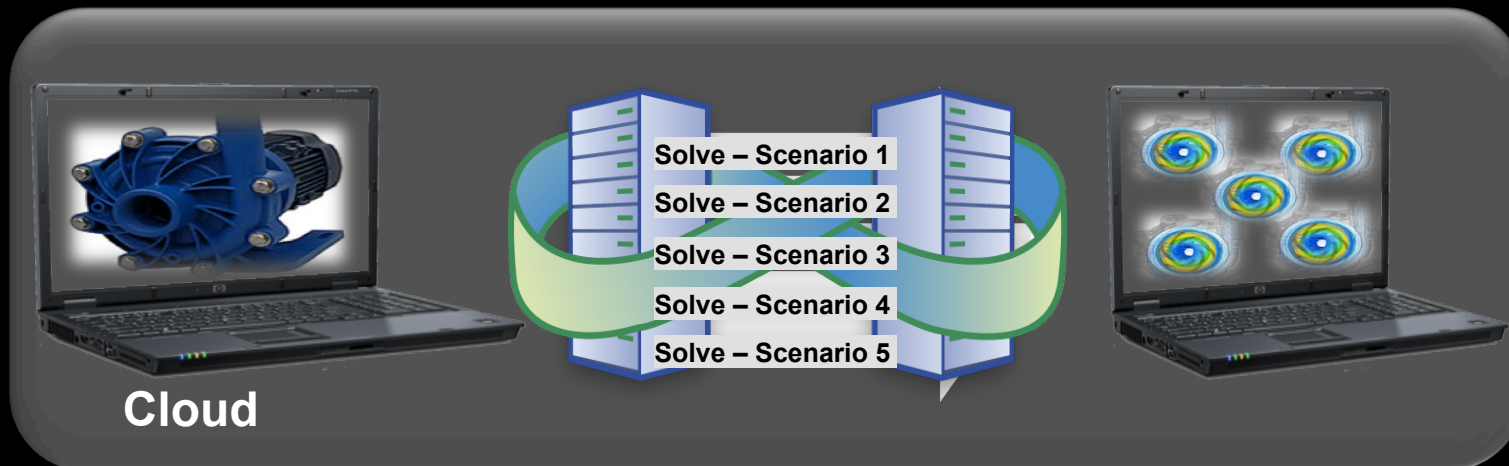
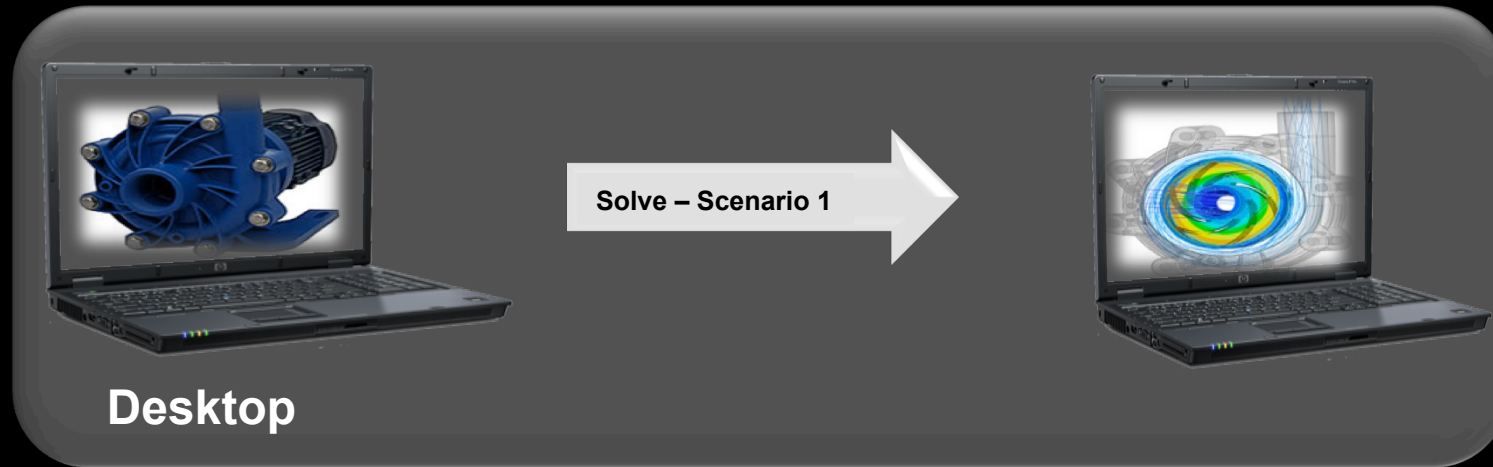


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Asset Price

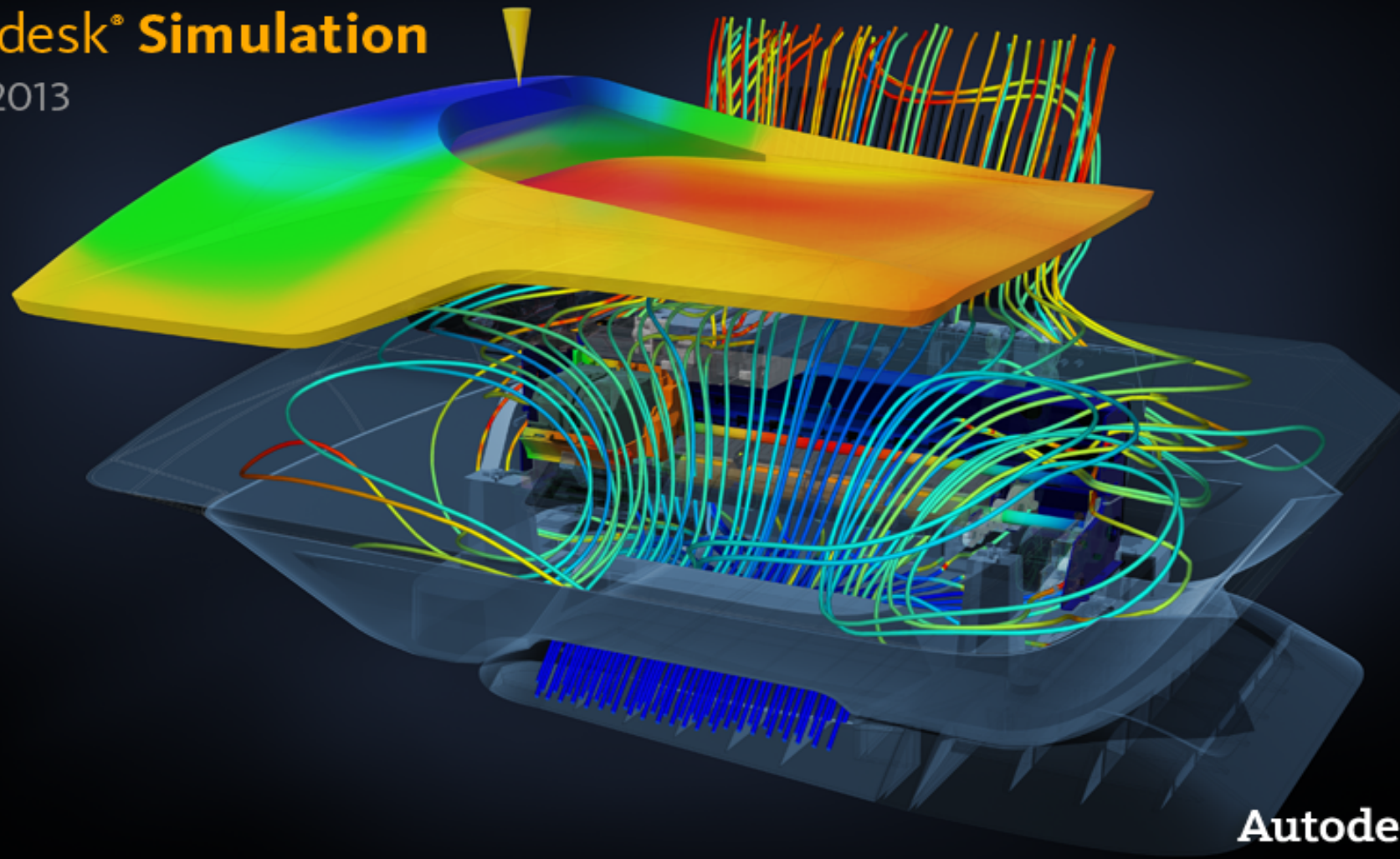


Infinite Computing Power and Optimization in the Cloud



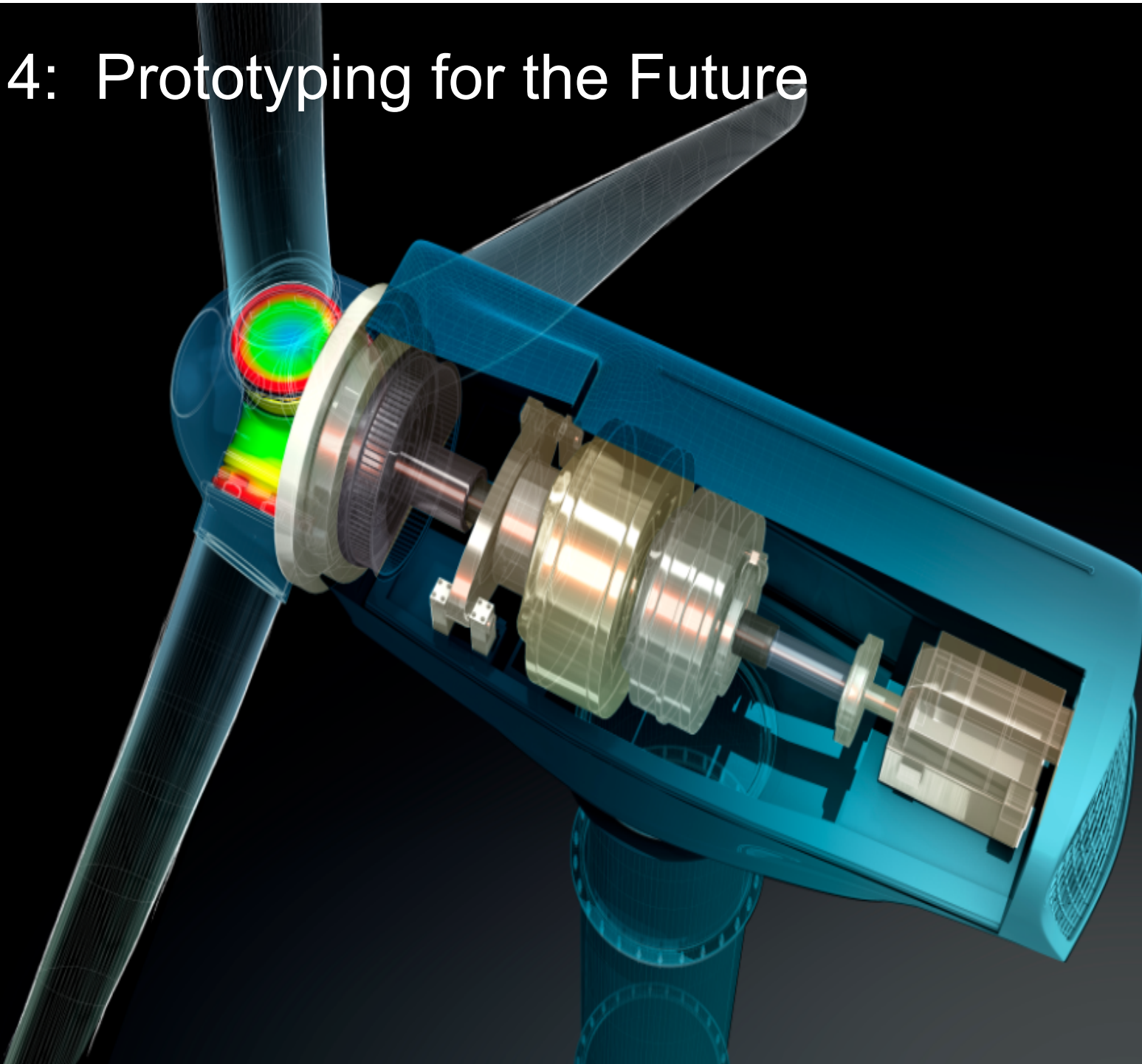
Autodesk® Simulation

360 2013

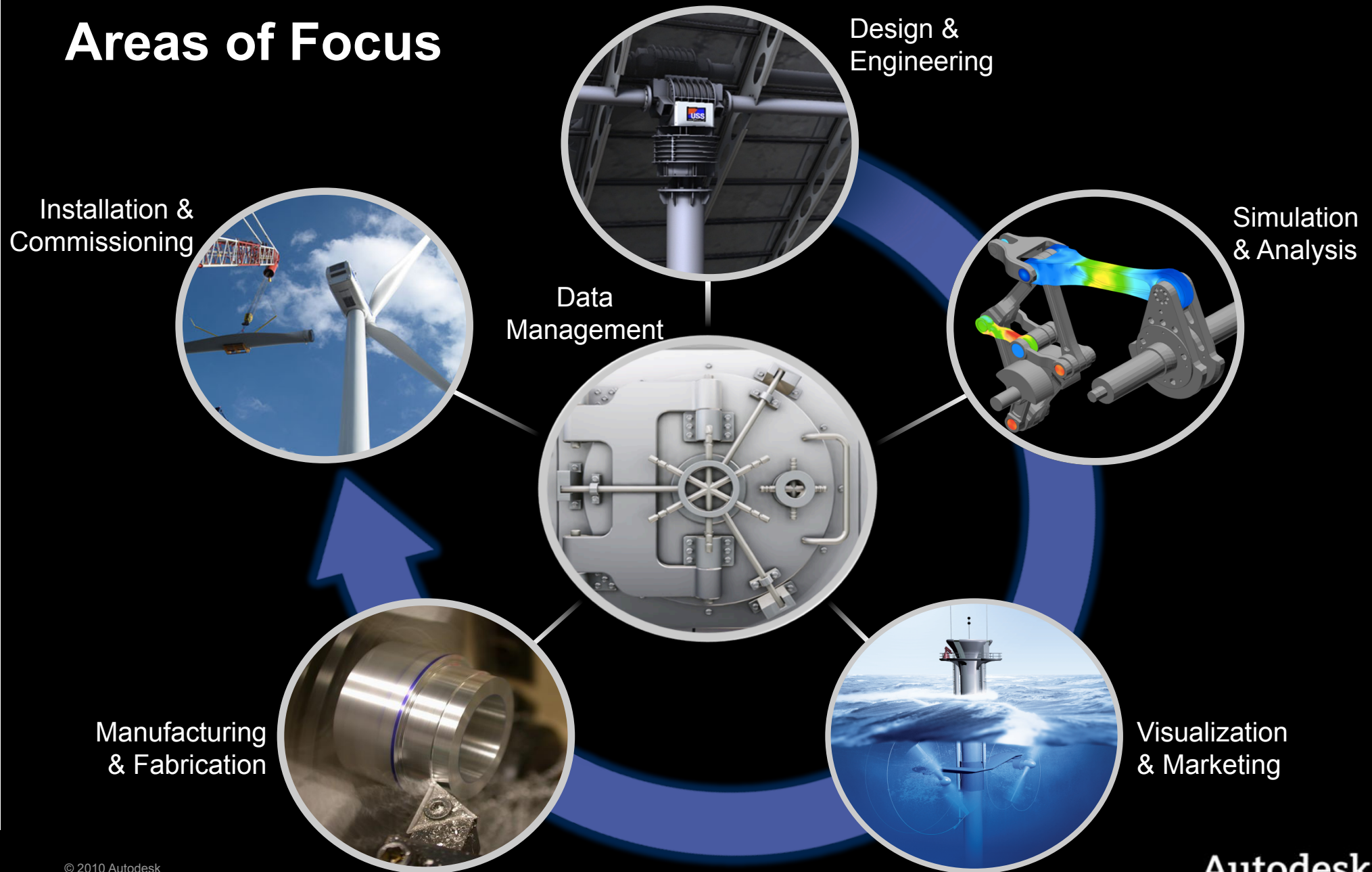


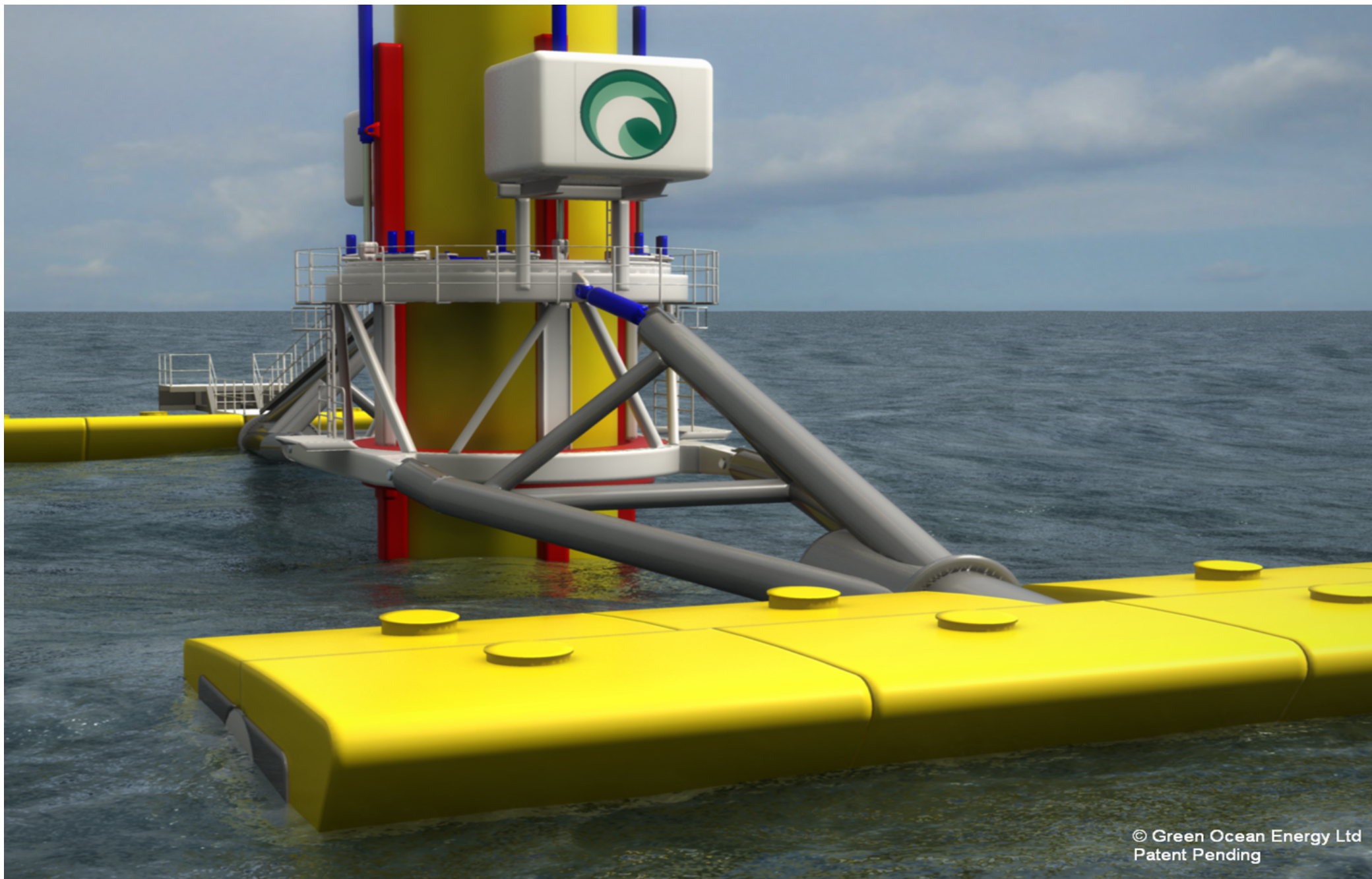
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Trend 4: Prototyping for the Future



Areas of Focus





© Green Ocean Energy Ltd
Patent Pending

Computational Fluid Dynamics

Head-Up Controls



Model Display

- ☒ Element Outlines
- ☒ Element Surfaces
- ☒ Ground Plane Grid
- ☐ 3D Analysis Grid

Load Model/Data File...

Analysis Grid Settings...

Real-Time Analysis

- ☒ Show Real-Time Air Flow

2D Analysis 3D Analysis

Velocity: 96.80

Angle: 317.0

Display: Wind Velocity

Update Revit

Reset

Data and Scale

2D Grid Slice

- ☒ Show 2D Data Slice

Position: 520.0

3D Axis: XY (horizontal)

Animate: Cycle Go

Display: Coloured Cells

- ☒ Show Grid Lines

- ☒ Displace Values in 3D

Amount: 0.152

Send to Current View...

3D Volumetric

- ☐ Show 3D Volumetric

Threshold: 0.500 Apply

Display: Point Cloud

Flow Line Settings... Go

Send to Current View...

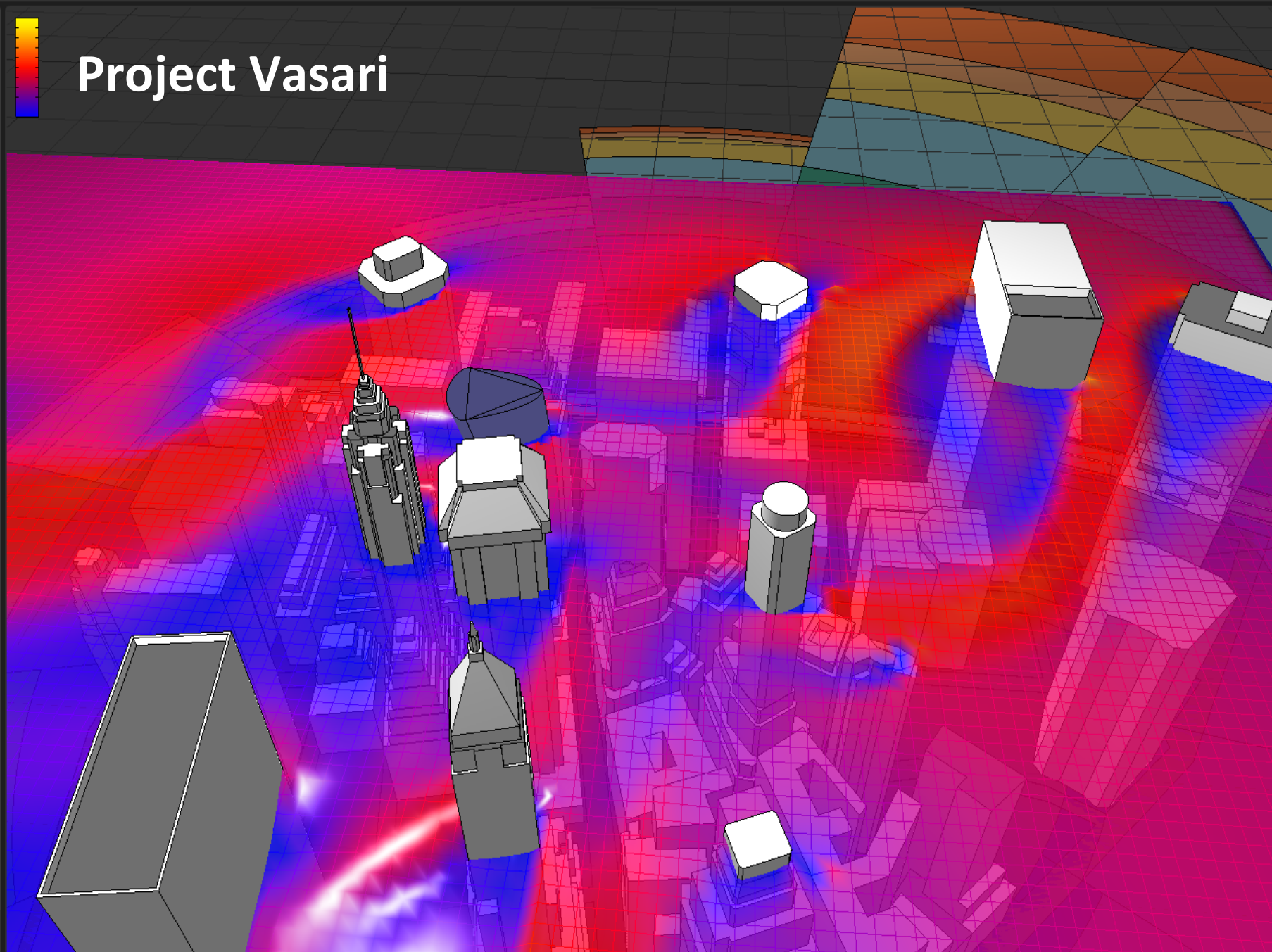
Map to Selected Face(s)

Revit Project

View Settings

Autodesk // LABS
Prototype/Experimental Revit Plug-Ins

Project Vasari



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