

MEEN 5110/4110: Alternative Energy



Spring 2008

Tuesdays and Thursdays

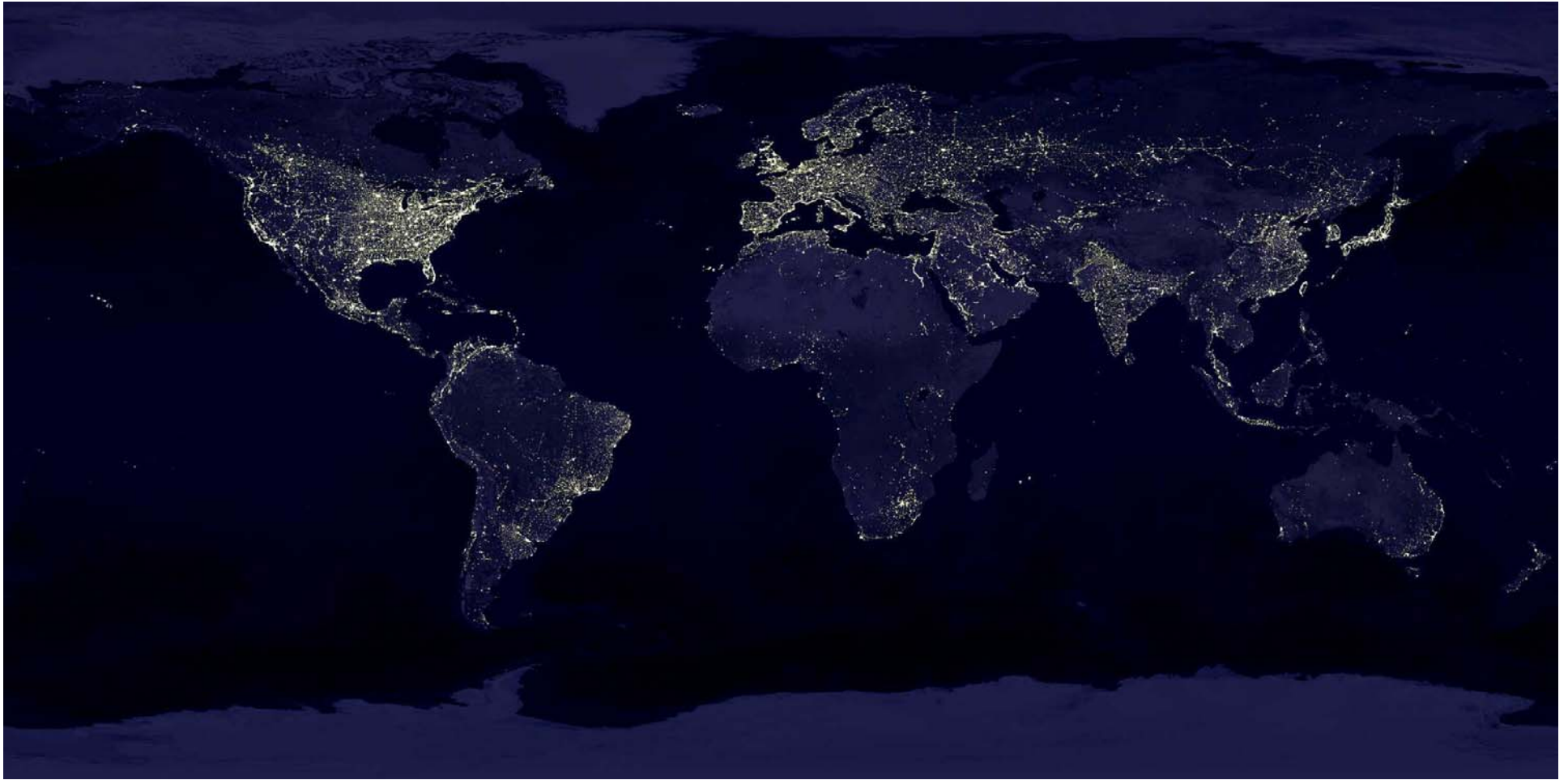
11:00am – 12:30pm

UNTRP B192

Lecture 01

Dr. Matthew J. Traum

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Explain the Distribution of Energy Utilization Apparent in this Map.

Today's Agenda

1. Entry Survey

2. Cover Syllabus

3. How the Web Site Works

4. Assign Graduate Modules

5. Introductory Lecture

Graduate Modules (Part 1)

February 4 – February 17

Module 2: Energy Directly from the Sun

Photovoltaic Power, Solar-Thermal Heat/Energy, Passive Accumulation Techniques, Day Lighting

February 18 – March 2

Module 3: Biological/Organic Energy Sources

Ethanol, Methanol, Bio-diesel, Biomass as a Fuel, Organic Photovoltaic Power

March 3 – March 16

Module 4: Energy from The Earth

Nuclear Power, Geothermal Heat/Energy, Deep Ground Heat Pumps, Ocean Thermal Heat/Power

Graduate Modules (Part 2)

March 24 – April 6

Module 5: Improving End Use Efficiency

Lighting, Insulation, Conservation, and Recycling Technology

April 7 – April 13

Module 6: Energy From Fluid Flows

Hydroelectric Power, Wind Power, Tidal-Lunar Power, Capturing Wave Energy

April 14 – April 27

Module 7: The H₂ Economy, Energy Storage and Transport

Hydrogen as an Energy Carrier, Superconducting Grid, Fuel Cells, Batteries

Lecture: What do all those Terms Mean?

1. Alternative Energy

2. Renewable Energy

3. Sustainable Energy

4. Green Energy

5. Appropriate Technology

What do all those Terms Mean?

“Alternative Energy”

The US Department of the Interior says:

“Fuel sources that are other than those derived from fossil fuels. Examples include: wind, solar, biomass, wave and tidal energy.”

<http://www.mms.gov/offshore/RenewableEnergy/Definitions.htm>

Dr. Traum says:

Alternative refers to any non-fossil-fuel energy source, but it does not necessarily have to be renewable. Nuclear energy is one example, since the available fissionable material on the planet is finite. Geothermal energy, which can be exhausted if seismic events disrupt heat sources, is another alternative energy example.

What do all those Terms Mean?

“Renewable Energy”

The US Department of the Interior says:

“Energy resources that are naturally replenishing but flow-limited. They are virtually inexhaustible in duration but limited in the amount of energy that is available per unit of time. Renewable energy resources include: biomass, hydro, geothermal, solar, wind, ocean thermal, wave action, and tidal action.”

<http://www.mms.gov/offshore/RenewableEnergy/Definitions.htm>

What do all those Terms Mean?

“Renewable Energy”

Dr. Traum says:

“Renewable” energy arises from sources that are consumed at the same rate they are produced. However, these sources are not necessarily sustainable because they cause pollution. Combustion of organically-derived products falls into this category; for example, burning bio-diesel for transportation. The fuel is derived from sugar, corn, and other plants, which can be re-grown. However, the products of combustion beyond carbon dioxide and water (i.e., unburned hydrocarbons and NO_x) are not absorbed by plants as they grow. So, these pollutants can build up in the atmosphere over time.

What do all those Terms Mean?

“Sustainable Energy”

The British say:

“Energy that can be produced economically and safely for all time without impacting the environment and well-being of future generations.” <http://www.cotswold.gov.uk/>

Dr. Traum says:

“Sustainable” refers to energy sources that create no pollution in the conventional sense but may have other undesirable environmental consequences and hence are not green. Wind power is one example, given environmentalists’ concerns about migrating birds being struck and killed by rotating turbine blades. Hydroelectric energy is another example. Damming rivers provides a continuous flow of energy but destroys natural habitats and dramatically upsets the surrounding environment.

What do all those Terms Mean?

“Green Energy”

Green Technology .org says:

The field of "green technology" encompasses a continuously evolving group of methods and materials, from techniques for generating energy to non-toxic cleaning products.

The present expectation is that this field will bring innovation and changes in daily life of similar magnitude to the “information technology” explosion over the last two decades. In these early stages, it is impossible to predict what “green technology” may eventually encompass.

<http://www.green-technology.org/what.htm>

What do all those Terms Mean?

“Green Energy”

Dr. Traum says:

“Green” energy is the most environmentally benign. It creates no pollution and has no detrimental environmental impacts.

Photovoltaic and solar-thermal energy closely match this definition. However, even these technologies do induce some environmental impact. The fabrication of PV panels consumes energy from non-renewable sources and produces pollution. Solar installations block sunlight that would otherwise reach the ground. Therefore, these installations (especially large ones) can dramatically impact the surrounding environment.

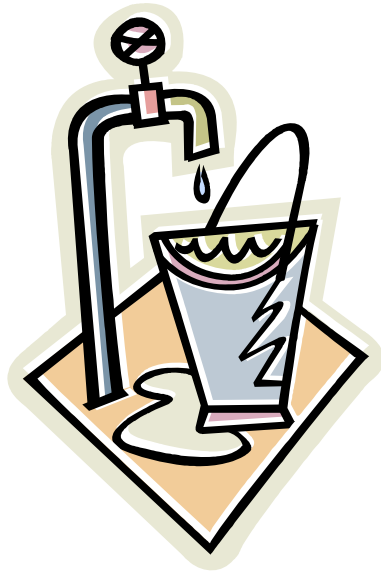
What do all those Terms Mean?

“Appropriate Technology”

In 1955, E.F. Schumacher first used the expression:
Appropriate technology is earth- and user-friendly technology
matched to the scale of community life.

Dr. Traum says:

In the context of energy generation, distribution, and utilization,
“appropriate technology” is the engineering solution that most
closely matches the needs of the community while best
approximating Traum’s definition of Green Energy.



Energy vs. Power

“A BTU, a Joule, or a Watt?”

British Thermal Unit (BTU): Unit of (heat) energy still used in the United States. The energy needed to raise one pound of water by one degree Fahrenheit.

Joule: The SI unit for energy defined by a force of one Newton moving one meter along the direction of the force.

Watts: The SI unit for power. 1 volt of electric potential carrying 1 ampere of current through a resistive load dissipates 1 watt.

Closing Thought:

***Beware of tree-huggers and
perpetual motion machines.***