SEATTLEU
CENTER FOR ENVIRONMENTAL JUSTICE AND SUSTAINABILITY

Climate, Education and Sustainability

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SEATTLE UNIVERSITY CEJS

Roadmap

Environmental, Economic, and Social Impacts of Climate

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Education's Role in Sustainable Development

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Climate & Energy Education in the U.S.

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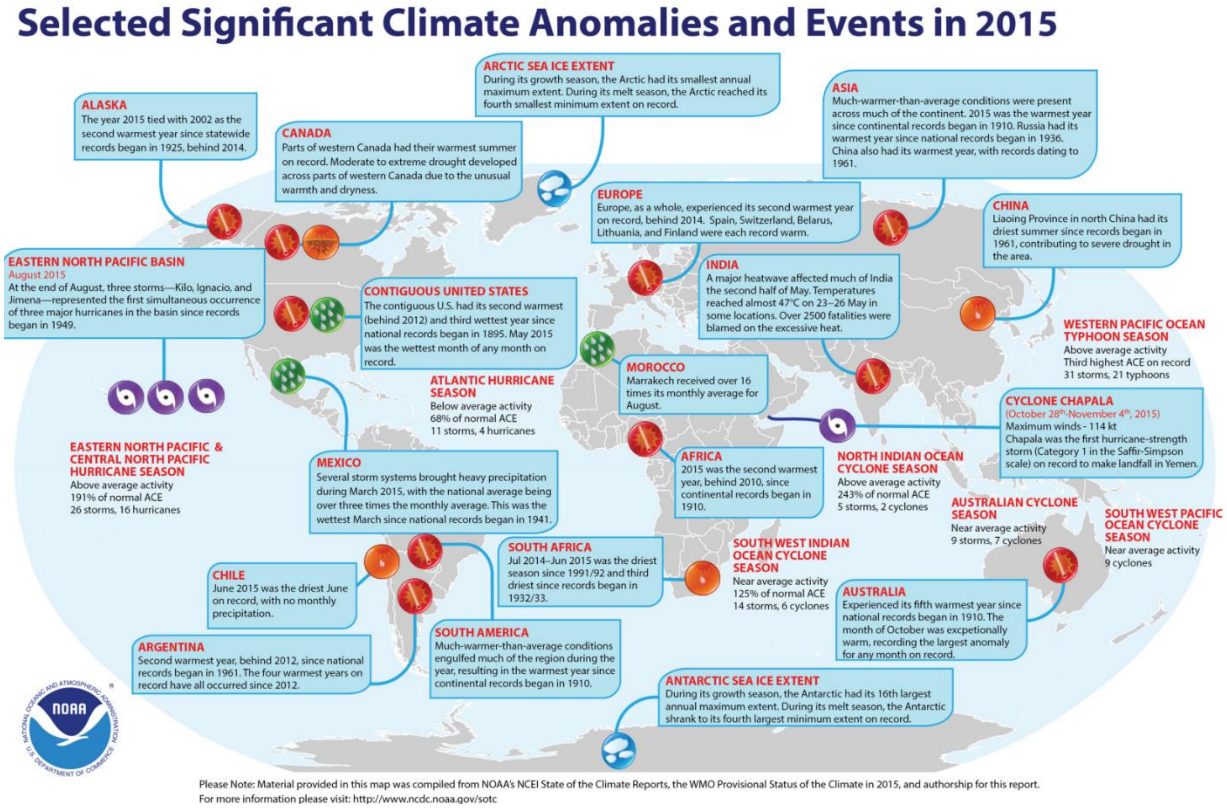
Sustainable Solutions

Photo: SounderBruce | flickr.com

Climate Impacts: Environmental



Source: NOAA State of the Climate Reports - August 2016

Climate Impacts: Economic

Hurricane Sandy, NY: $68 billion damage[1]

Wildfire suppression: $15 billion, 2004 - 13[2]

Photos: Timothy Krause | Flickr.com; USDA | Flickr.com

Climate Impacts: Social

- Over 1 billion people do not have access to energy.[1]
- Over 2.9 billion people still lack access to clean cooking.[2]
- Women's annual pay in 2015 is the same as the amount of pay men received in 2005.[3]
- More than 88 percent of the current burden of disease related to climate change occurs in children under age 5.[4]

Education's Role in Sustainable Development

United Nations Decade of Education for Sustainable Development (2005 - 2014)

↓

UNESCO Global Action Programme on Education for Sustainable Development

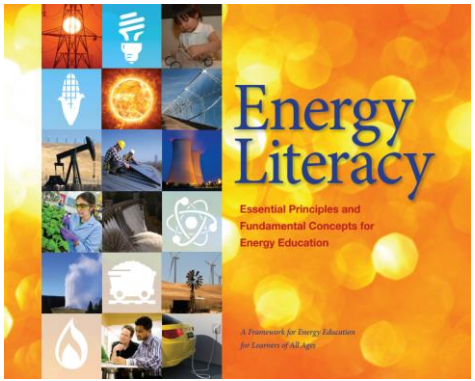
UNESCO and Sustainable Development Goals

U. S. Climate Education

NOAA Climate.gov

U.S. Energy Education

- Energy a Crosscutting Concept in Next Generation K-12 Science Standards
- National Energy Education Summit
- Energy Literacy: Essential Principles and Fundamental Concepts for Energy Education
- Universities Creating New Energy Programs and Institutes



Energy and the Greenhouse Effect

Energy production and use represent ⅔ the world's greenhouse gas emissions.

-International Energy Agency, 2015

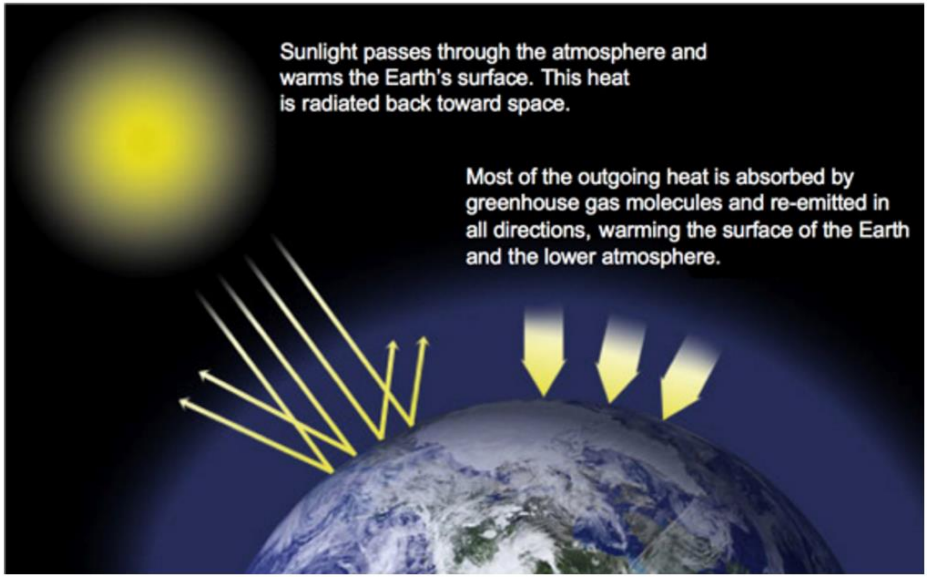
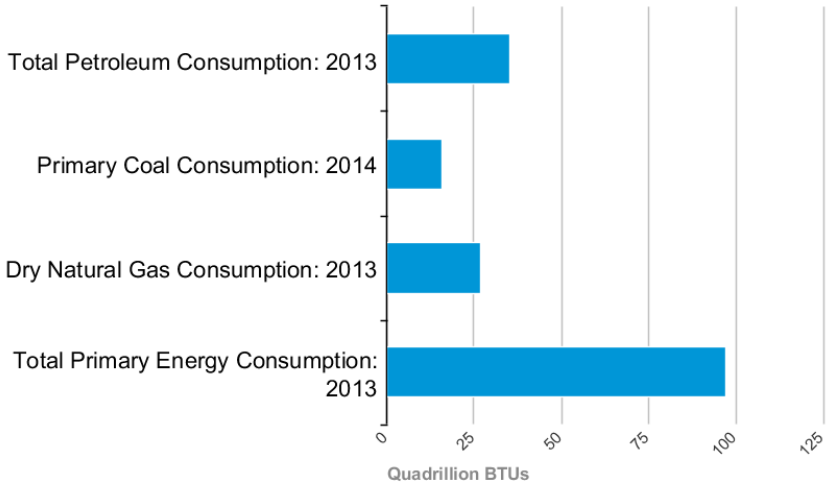


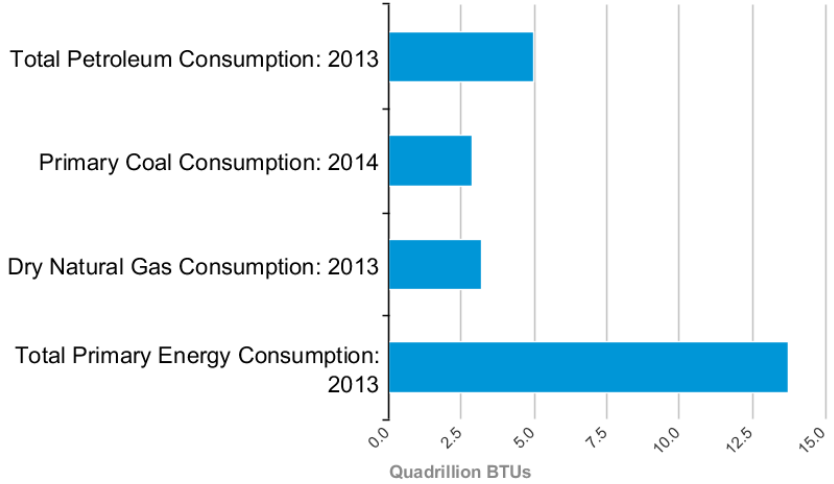
Image: NASA's Global Climate Change website http://climate.nasa.gov/causes/

U.S. Fossil Fuel Consumption



eia Source: U.S. Energy Information Administration

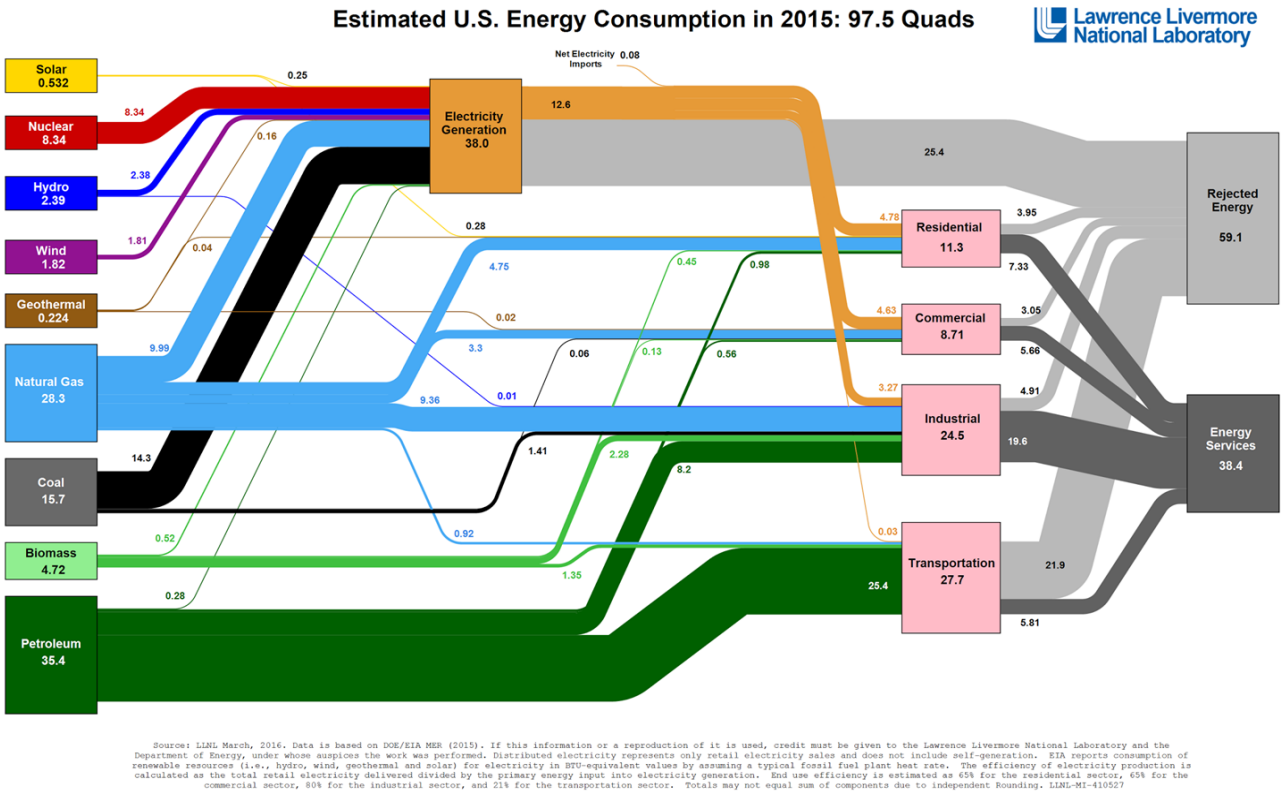
German Fossil Fuel Consumption



eia Source: U.S. Energy Information Administration

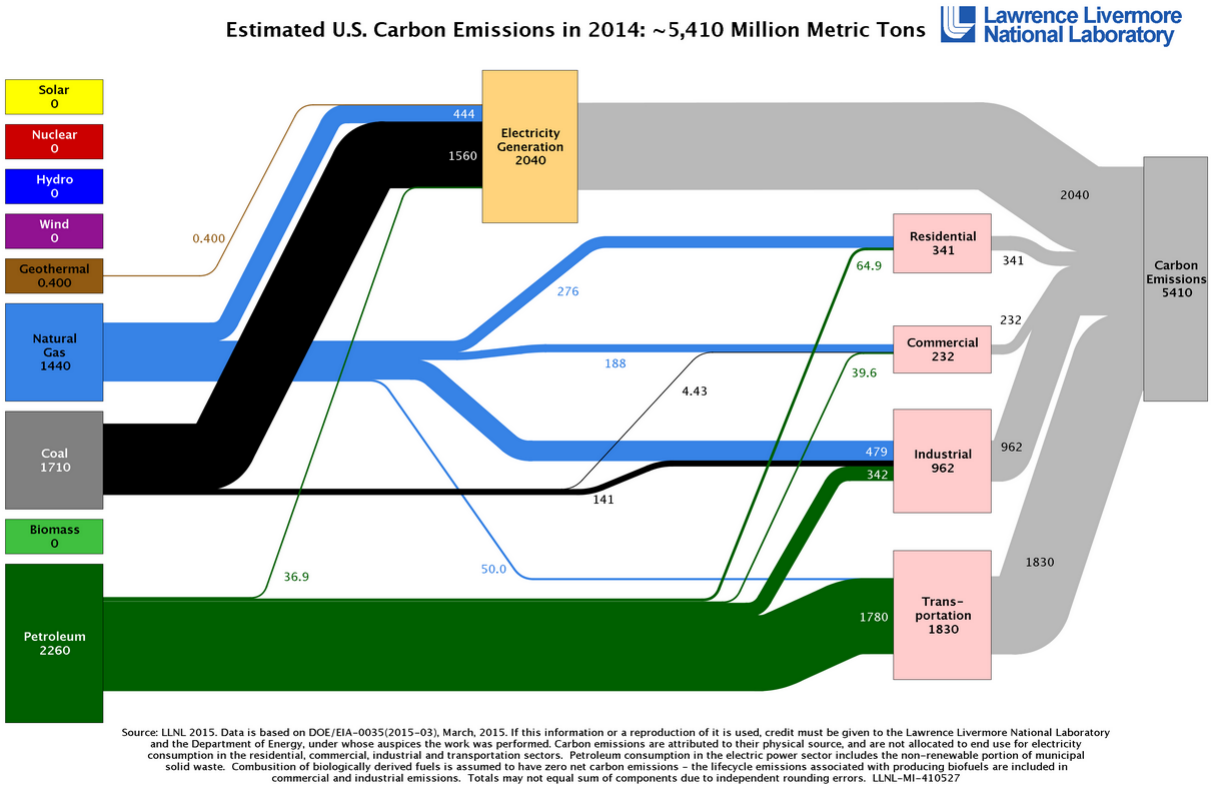
Source: U.S. Energy Information Administration

U. S. Energy Consumption



Source: Lawarence Livermore National Laboratory and the US Department of Energy Flowcharts.llnl.gov

U.S. Carbon Emissions Related to Energy Use



Carbon Combustion:

$$C + O_2 \rightarrow CO_2 + \text{heat}$$

Source: Lawarence Livermore National Laboratory and the US Department of Energy Flowcharts.llnl.gov

Energy as an Opportunity

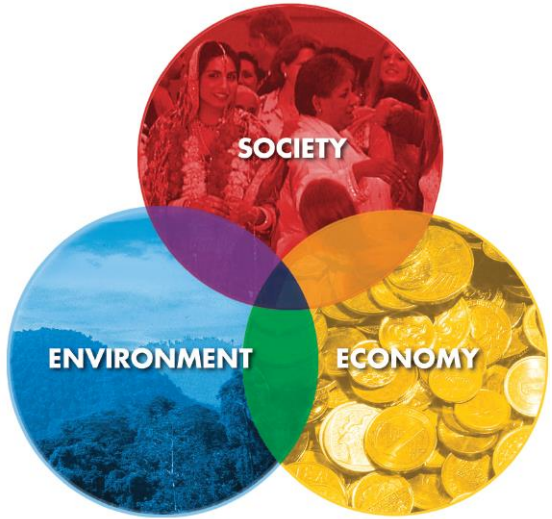
“ Sustainable energy is the golden thread that connects economic growth, increased social equity and an environment that allows the world to thrive. Low-carbon growth can foster decent jobs, empower women, promote equality, provide access to sustainable energy, make cities more sustainable and enhance the health of both people and the planet.”

UN SECRETARY-GENERAL BAN KI-MOON

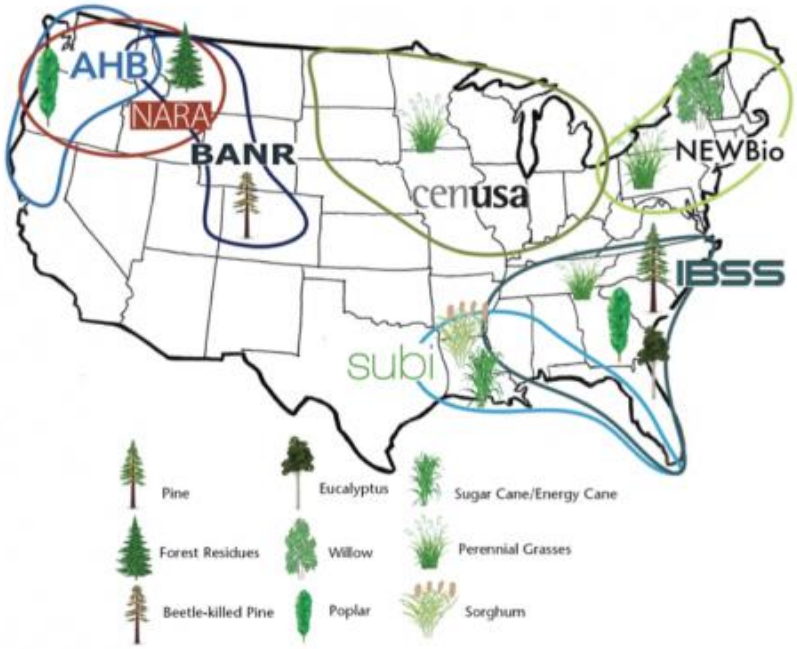
MESSAGE TO THE CLEAN ENERGY MINISTERIAL MEETING
MAY 2014

Components of Sustainable Solutions

- Intergenerational Responsibility
- Interconnectedness
- Systems Thinking
- Multiple Perspectives
- Structural Solutions
- Personal Solutions

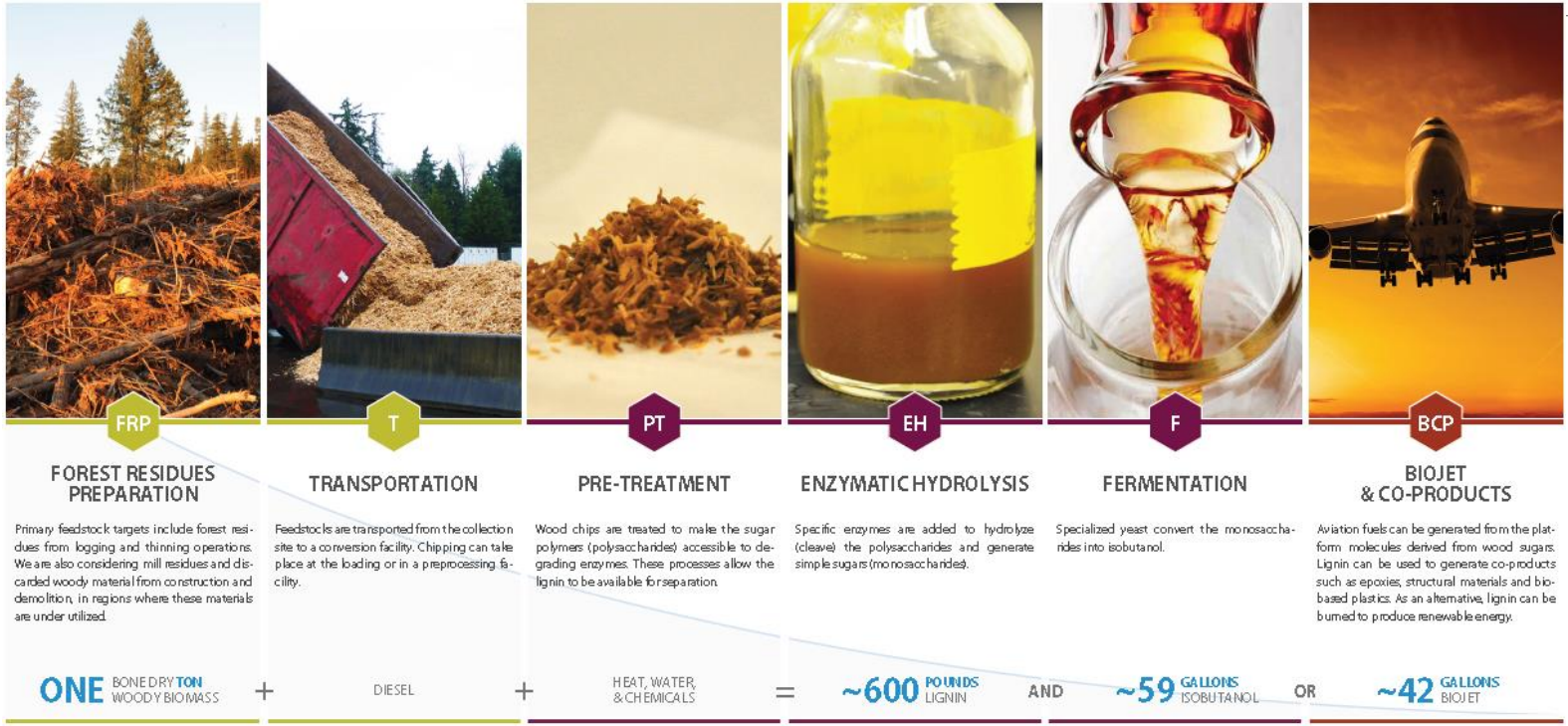


Sustainable Solutions:
Examples from the Pacific Northwest

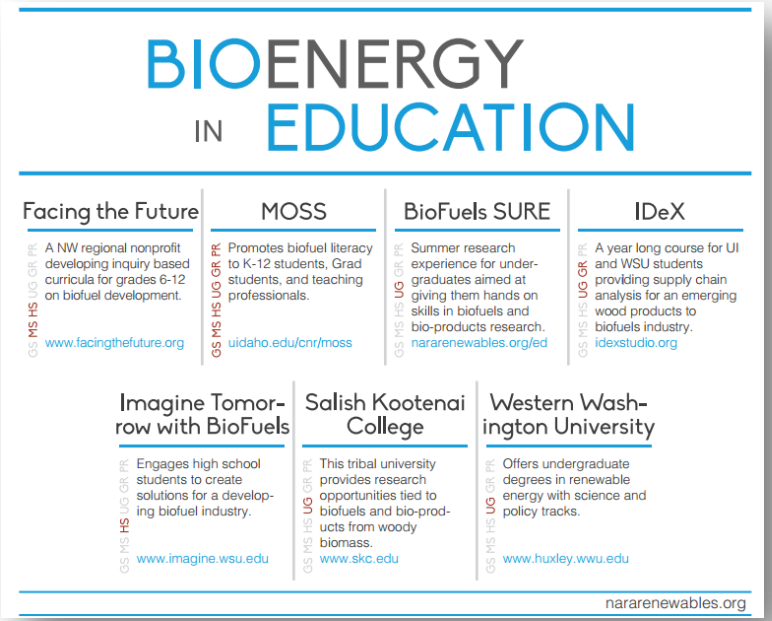


nifa.usda.gov

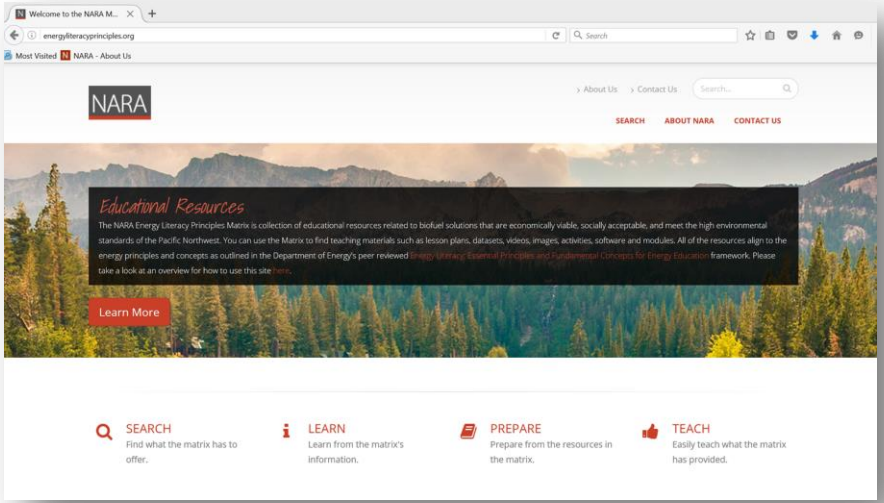
Northwest Advanced Renewables Alliance (NARA)



Education at the Speed of Research



www.nararenewables.org



www.energyliteracyprinciples.org

R. Justin Hougham, Ph.D,
University of Wisconsin-Extension

Other Education Efforts

- Global Sustainability Curriculum - www.facingthefuture.org
- WA State K-12 Integrated Environmental and Sustainability Learning Standards
- WA Green Schools
- University Centers and Programs:
  - Seattle University | Center for Environmental Justice and Sustainability
  - University of Washington | Clean Energy Institute
  - Western Washington University | Institute for Energy Studies

Youth-led Solutions

Community/City Solutions

- Capitol Hill EcoDistrict
- Seattle 2030 District
- International Living Future Institute:

  Living Building Challenge

  http://living-future.org/

  http://capitolhillecodistrict.org/

  http://www.bullittcenter.org/

Personal Solutions

- Home
- Travel Driving/Flying
- Food and Diet
- Recycling and Waste
- Stuff

- WWF - UK | footprint.wwf.org.uk/
- The Nature Conservancy | www.nature.org/greenliving/carboncalculator/
- Carbon Footprint of Nations | carbonfootprintofnations.com/

Photo: ccPix.com

Acknowledgements:

Konrad Adenaur Stiftung

US Consulate General Hamburg

Hamburg Climate Week

USDA-NIFA NARA

THANK YOU!

Additional Resources:

- Facing the Future | Western Washington University: www.facingthefuture.org
- NARA Energy Literacy Principles Matrix: www.energyliteracyprinciples.org
- Climate Voices Science Speaker Network: http://climatevoices.org/
- Climate Literacy and Awareness Network: www.cleanet.org
- Global Action Programme on Education for Sustainable Development: http://en.unesco.org/gap
- Energy Literacy Framework: http://energy.gov/eere/education

References

United Nations, *Sustainable Development Goals: Goal 13: Take urgent action to combat climate change and its impacts*, accessed September 26, 2016, http://www.un.org/sustainabledevelopment/climate-change-2/.

Unicef United Kingdom, Climate change: children's challenge, https://www.unicef.org.uk/Documents/Publication-pdfs/unicef-climate-change-report-2013.pdf

EPA. 2015. Climate Change in the United States: Benefits of Global Action. United States Environmental Protection Agency, Office of Atmospheric Programs, EPA 430-R-15-001, https://www.epa.gov/sites/production/files/2015-06/documents/cirareport.pdf.

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UNESCO Roadmap for Implementing the Global Action Programme on Education for Sustainable Development, (United Nations Educational, Scientific, and Cultural Organization, Paris, France, 2014), http://unesdoc.unesco.org/images/0023/002305/230514e.pdf.

Jan DeWaters and Susan Powers. (2008, October 22-25) Energy Literacy among Middle and High School Youth. In Session T1A of the 38th ASEE/IEEE Frontiers in Education Conference, Saratoga Springs, NY. 978-1-4244-1970-8/08

International Energy Agency. (2015). *World Energy Outlook Special Report: Energy and Climate Change*, Paris, France: OECD/IEA.

U.S. EIA, "Fossil fuels still dominate U.S. energy consumption despite recent market share decline," Today in Energy, July 1, 2016, http://www.eia.gov/todayinenergy/detail.cfm?id=26912.

Capitol Hill EcoDistrict, accessed September 26, 2016, https://capitolhillecodistrict.org/.

2030 Districts, Seattle 2030 District, accessed September 26, 2016, https://capitolhillecodistrict.org/.

Bullitt Center, accessed September 26, 2016, http://www.bullittcenter.org/; International Living Future Institute, accessed September 26, 2016, http://www.bullittcenter.org/.

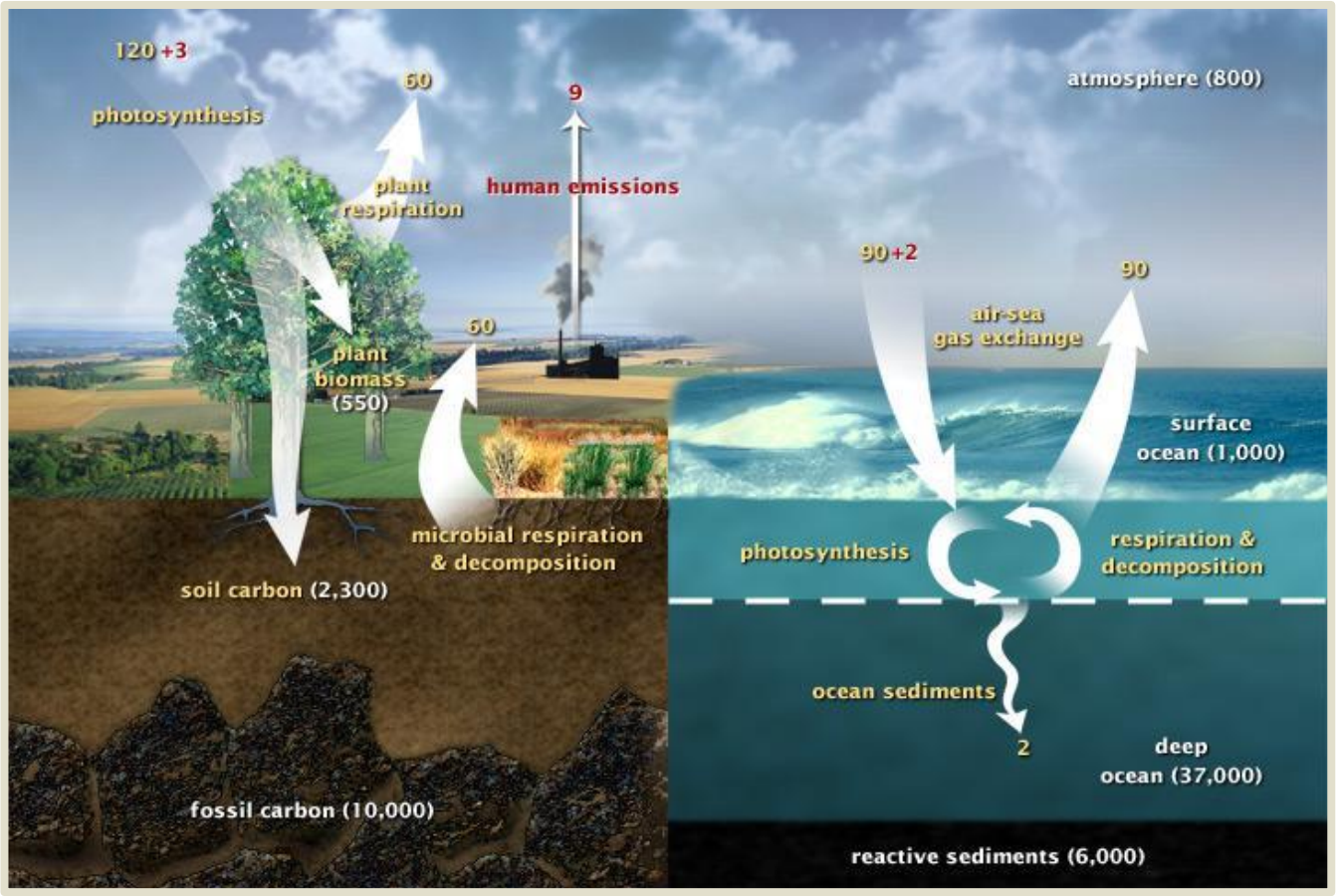
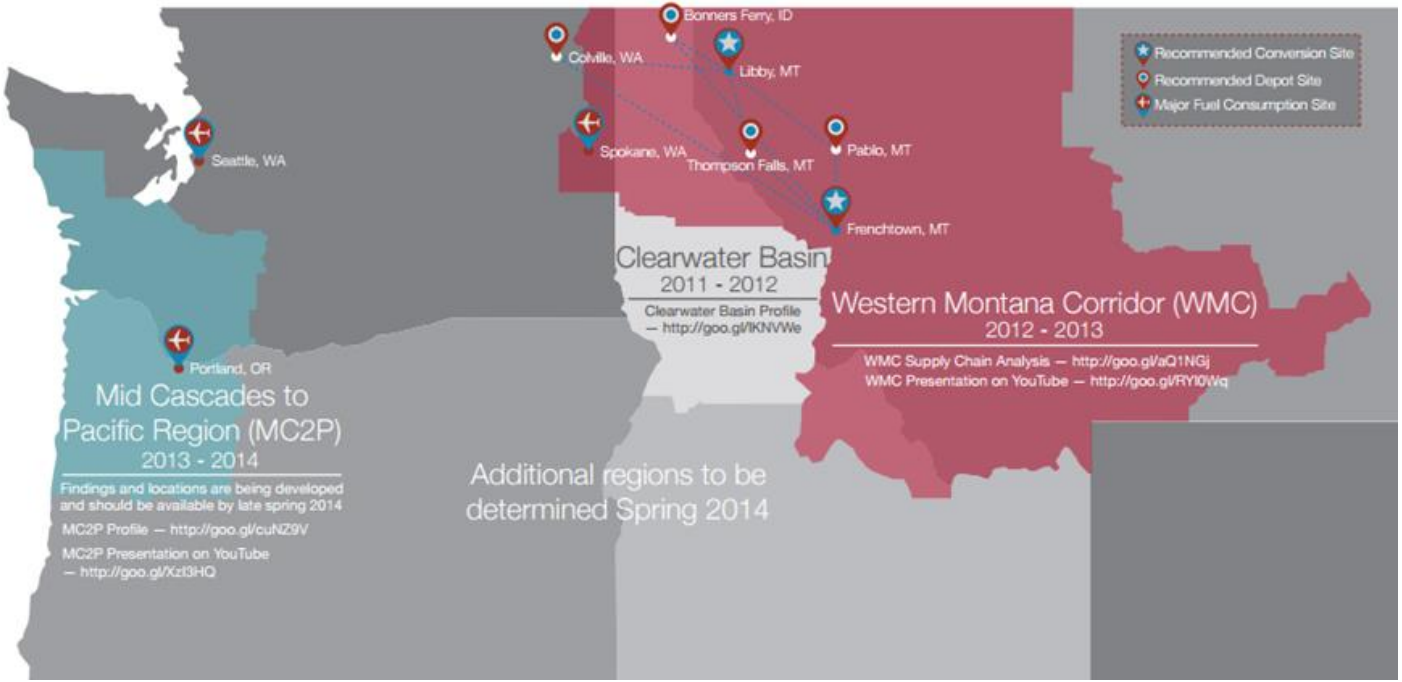


Image: NASA, http://earthobservatory.nasa.gov/Features/CarbonCycle/

Wood to Wing

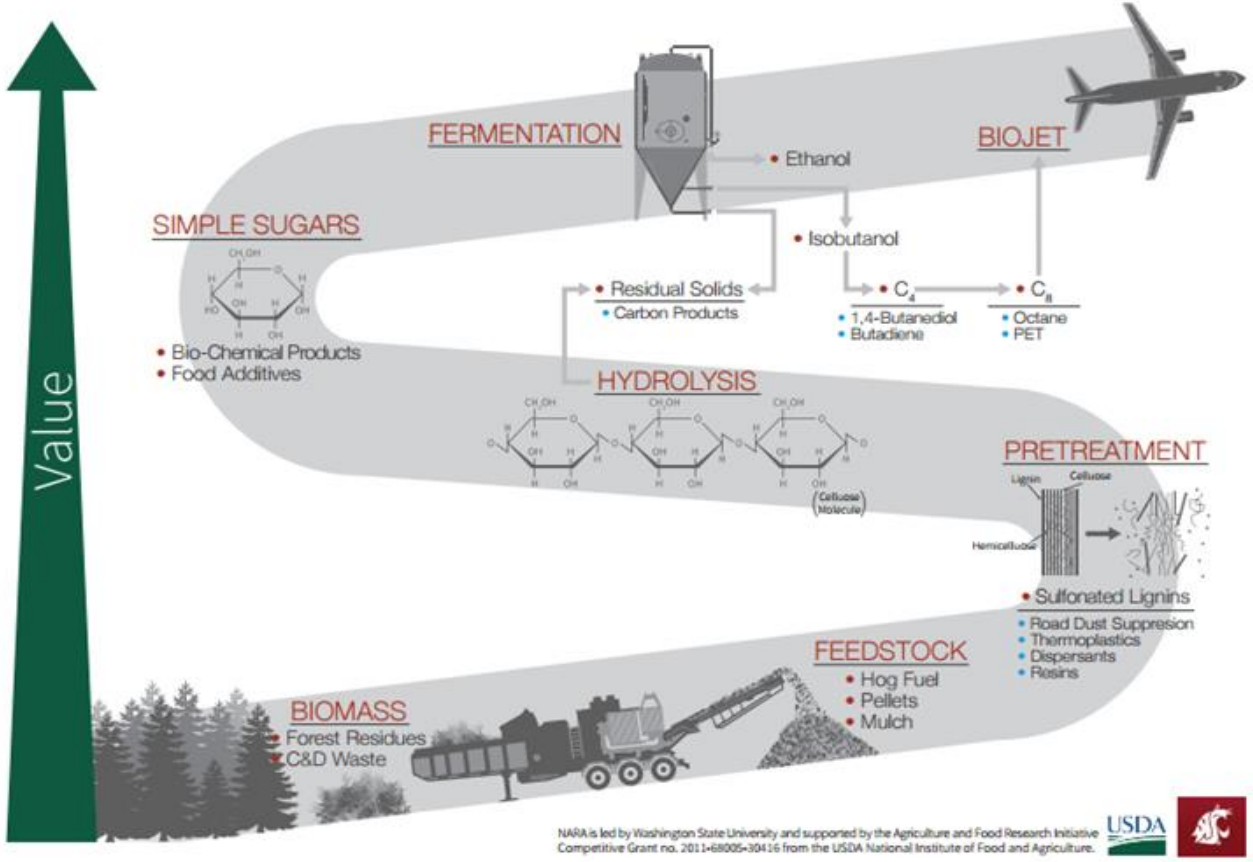
Forest Residuals to Biofuel Supply Chains in the Pacific Northwest

Applying research-based findings, NARA and regional stakeholders identify conversion and depot sites in the Pacific Northwest. These site locations provide the best opportunity for economic, social and environmental success to develop a forest residuals to biofuel and co-products industry.



SUPPLY CHAIN PRODUCTS

NARA
Northwest Advanced Renewables Alliance



NARA is led by Washington State University and supported by the Agriculture and Food Research Initiative Competitive Grant no. 2011-68005-30416 from the USDA National Institute of Food and Agriculture.

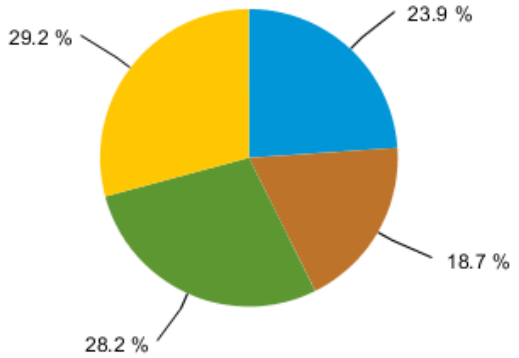
USDA

NARA

SEARCH ABOUT NARA CONTACT US

Topic: 1. Energy is a physical quantity that follows precise natural laws.	**Topic:** 2. Physical processes on Earth are the result of energy flow through the Earth system.	**Topic:** 3. Biological processes depend on energy flow through the Earth system.	**Topic:** 4. Various sources of energy are used to power human activities.	**Topic:** 5. Energy decisions are influenced by economic, political, environmental, and social factors.	**Topic:** 6. The amount of energy used by human society depends on many factors.	**Topic:** 7. The quality of life of individuals and societies is affected by energy choices.	**Topic:** 8. Wood based bio-fuels are one form of energy that is renewable
Sub-Topic: 1.1 Energy is a quantity that is transferred from system to system.	**Sub-Topic:** 2.1 Earth constantly changes as energy flows through the system.	**Sub-Topic:** 3.1 The Sun is the major source of energy for organisms and the ecosystems of which they are a part	**Sub-Topic:** 4.1 Humans transfer and transform energy from the environment into forms useful for human endeavors	**Sub-Topic:** 5.1 Decisions concerning the use of energy resources are made at many levels.	**Sub-Topic:** 6.1 Conservation of energy has two very different meanings.	**Sub-Topic:** 7.1 Economic security is impacted by energy choices.	**Sub-Topic:** 8.1 Sources of cellulosic residuals used are found in forest operations and in industry process
Sub-Topic: 1.2 The energy of a system or object that results in its temperature is called thermal energy.	**Sub-Topic:** 2.2 Sunlight, gravitational potential, decay of radioactive isotopes, and rotation of the Earth	**Sub-Topic:** 3.2 Food is a biofuel used by organisms to acquire energy for internal living processes.	**Sub-Topic:** 4.2 Humans use of energy is subject to limits and constraints.	**Sub-Topic:** 5.2 Energy infrastructure has inertia.	**Sub-Topic:** 6.2 One way to manage energy resources is through conservation.	**Sub-Topic:** 7.2 National security is impacted by energy choices.	**Sub-Topic:** 8.2 Transportation and logistic considerations shape cost and feasibility within supply chains.
Sub-Topic: 1.3 Energy is neither created nor destroyed.	**Sub-Topic:** 2.3 Earth's weather and climate are mostly driven by energy from the Sun.	**Sub-Topic:** 3.3 Energy available to do useful work decreases as it is transferred from organism to organism.	**Sub-Topic:** 4.3 Fossil and biofuels are organic matter that contain energy captured from sunlight.	**Sub-Topic:** 5.3 Energy decisions can be made using a systems-based approach.	**Sub-Topic:** 6.3 Human demand for energy is increasing.	**Sub-Topic:** 7.3 Environmental quality is impacted by energy choices.	**Sub-Topic:** 8.3 Pretreatment processess makes sugars more available.

Washington Energy Consumption by End-Use Sector, 2014

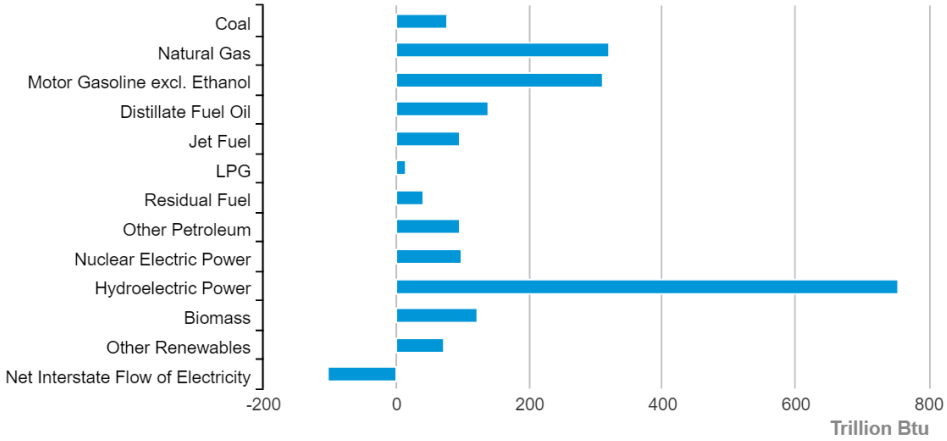


Source: Energy Information Administration, State Energy Data System

Consumption by Source | Consumption by Sector | Production | Electricity | Prices

Washington Energy Consumption Estimates, 2014

DOWNLOAD

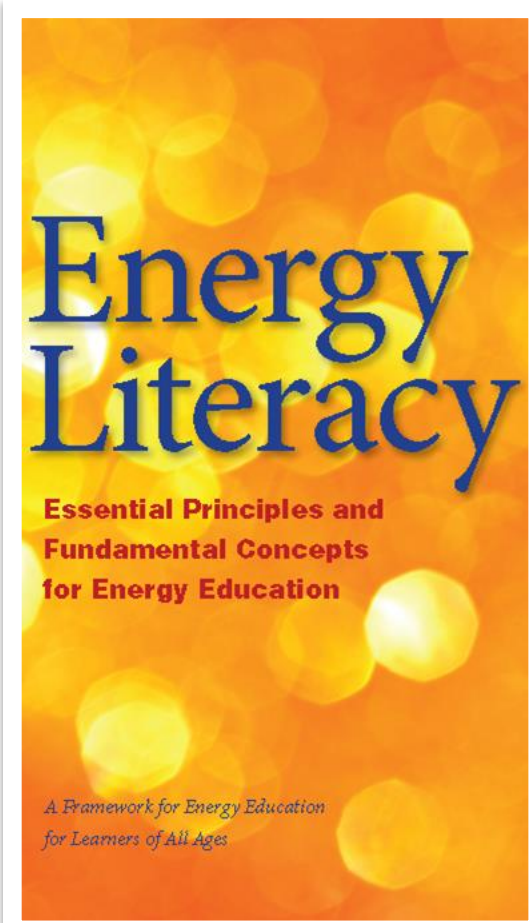


Source: Energy Information Administration, State Energy Data System

"*Literacy* implies not only the understanding of a particular, relevant body of knowledge and set of relationships, but moreover, the ability and willingness to *use* that knowledge in a functional manner - to read and write, to communicate, to participate in society."

J.E. DeWaters, S. E. Powers, and M. Graham

"Developing an Energy Literacy Scale."



1. Energy is a physical quantity that follows precise natural laws.
2. Physical processes on Earth are the result of energy flow through the Earth system.
3. Biological processes depend on energy flow through the Earth system.
4. Various sources of energy can be used to power human activities, and often this energy must be transferred from source to destination.
5. Energy decisions are influenced by economic, political, environmental, and social factors.
6. The amount of energy used by human society depends on many factors.
7. The quality of life of individuals and societies is affected by energy choices.

Annual High School Problem-solving Competition

http://imagine.wsu.edu/

Western Washington University

INSTITUTE FOR ENERGY STUDIES

BA: Energy Policy & Management

Minor: Energy Policy

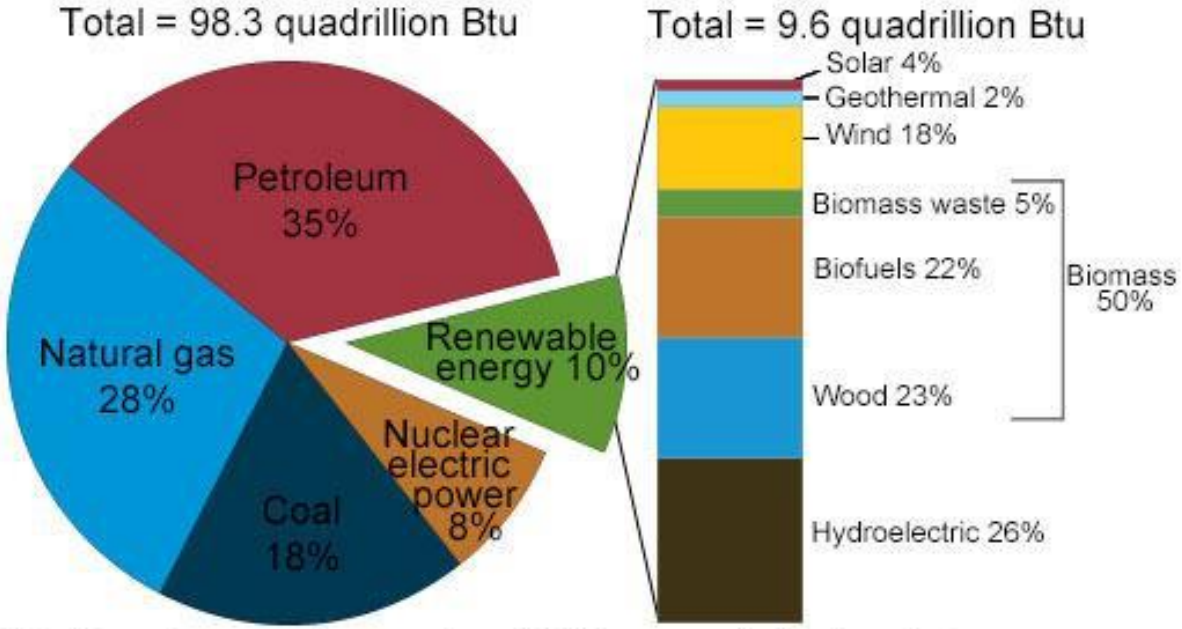
Minor: Energy Science

BS: Electrical Engineering w/ Energy Concentration

"Educating the leaders for our clean and efficient energy future through interdisciplinary studies and research."

WESTERN WASHINGTON UNIVERSITY
INSTITUTE FOR ENERGY STUDIES

U.S. energy consumption by energy source, 2014



Note: Sum of components may not equal 100% as a result of independent rounding.

Source: U.S. Energy Information Administration, *Monthly Energy Review*, Table 1.3 and 10.1 (March 2015), preliminary data

eia

Case Study: Northwest Advanced Renewables Alliance

Photo courtesy of R. Justin Hougham

A Changing World: Urbanization

1950: 30% world's population urban
2014: 54% world's population urban
2050: 66% world's population urban*

*United Nations, Department of Economic and Social Affairs, Population Division (2014). World Urbanization Prospects: The 2014 Revision, Highlights (ST/ESA/SER.A/352).

Photo: Sergey Vladimirov | Flickr.com