

I. Overview

- A. Provide a brief description of the new certificate.

Through interdisciplinary scholarship, the focus of this certificate will be to examine the current affairs of energy and sustainability. Students will begin with an overview of how energy affects our lives, and policy options for energy, as well as the science of energy and how we currently generate energy for society. Then students will have the option to choose three courses from a list of upper-division courses ranging from those in sustainability, geography and architecture to geology, engineering and economics.

- B. This proposed certificate (check one):

- Is cross disciplinary; or
 Is certified by a professional or accredited organization/governmental agency; or,
 Clearly leads to advanced specialization in a field; or,
 Is granted to a program that does not currently have a major.

- C. Why should this be a certificate rather than a concentration or a minor?

This set of courses augments and complements studies in engineering, architecture, business, public policy, sustainability and other disciplines, giving students a specialization in social and environmental aspects of energy studies, no matter what discipline they are in. This certificate program is meant to prepare students to utilize their education on energy in the workforce and enhance their employment opportunities.

- D. Affiliation

If the certificate program is affiliated with a degree program, include a brief statement of how it will complement the program. If it is not affiliated with a degree program, incorporate a statement as to how it will provide an opportunity for a student to gain knowledge or skills not already available at ASU.

This certificate will be offered by the School of Sustainability, which is a transdisciplinary unit which offers several courses on energy and sustainability. This certificate will allow students in any major to supplement their studies with a focus on energy and sustainability. This will be done by bringing together existing courses in a variety of units and creating one new course on the science of energy, specifically designed for students with a variety of backgrounds, making the topic of energy more accessible to students of the social sciences and humanities. This new course will also augment our Energy, materials and technology track in our BS here in SOS.

The certificate will provide students with an introduction to energy that is not yet organized anywhere at ASU. Although courses about energy are taught in a wide variety of units, existing programs related to energy are mostly in engineering. This energy and sustainability minor will bring together courses on energy in a variety of other units, providing the opportunity for students to study energy in a transdisciplinary, society-oriented, manner that will help prepare them for more advanced studies in energy (should they choose that path) and also provide them with enough of a background in energy studies to apply this knowledge to a wide range of majors, real-life applications, and business opportunities.

- E. Demand

Explain the need for the new certificate (e.g., market demand, interdisciplinary considerations).

By applying for a certificate in energy studies, the School of Sustainability is responding to repeated inquiries about the opportunities for energy studies, particularly by non-traditional students. The increasing attention to the study of energy reflects the increasing importance of energy to environmental quality, national security, and the efficient functioning of cities. ASU offers scattered courses in energy, mostly in engineering. The School of Sustainability wishes to meet a growing demand for the study of energy as a social issue with a technical component, rather than the other way around. The primary emphasis will be on sustainable energy futures, how we will adjust to them, and how they will affect us.

- F. Projected enrollment
What are enrollment projections for the first three years?

	1st Year	2nd Year (Yr. 1 continuing + new entering)	3rd Year (Yr. 1 & 2 continuing + new entering)
Number of Students (Headcount)	25	50	100

2. Support and Impact

A. Faculty governance

Provide a supporting letter from the chair of the academic unit verifying that the proposed certificate has received faculty approval through appropriate governance procedures in the unit and that the unit has the resources to support the certificate as presented in the proposal, without impacting core program resources.

The establishment of this Certificate has received approval by the interdisciplinary group of faculty listed in this document, as well as by the SOS Faculty. SOS Faculty approved the Certificate at the April 2013 Faculty Meeting.

B. Other related programs

Identify other related ASU programs and outline how the new certificate will complement these existing ASU programs. (If applicable, statements of support from potentially-affected academic unit administrators need to be included with this proposal submission.)

ASU offers scattered courses in energy, in units all over the University. The School of Sustainability wishes to bring these courses together so that they are visible to those with an interest in energy, particularly an interdisciplinary understanding. We also aim to meet a growing demand for the study of energy as a social issue with a technical component, rather than the other way around. This certificate aims to focus specifically on energy and sustainability, with an interdisciplinary approach to the study of energy and its relationships with society, the environment, transportation, human health and public policy. The degree programs that currently exist in energy at ASU are in Engineering, especially at the College of Technology and Innovation, where they have numerous courses about alternative energy technologies. However, these courses are often not appropriate for students without an engineering background.

C. Letter(s) of support

Provide a supporting letter from each college/school dean from which individual courses are taken.

(See Attached)

3. Academic Curriculum and Requirements**A. Knowledge, competencies, and skills**

List the knowledge, competencies, and skills (learning outcomes) students should have when they complete this proposed certificate. Examples of program learning outcomes can be found at (<http://www.asu.edu/oue/assessment.html>).

Successfully completing the certificate in energy and sustainability will signify a basic competence in how to apply sustainable energy concepts in various segments of the workplace, such as planning, business operations, building design, economics, and environment quality.

Learning outcomes: Students will be able to:

- * Describe the most common ways in which electricity is generated for the grid, where the materials come from, and the associated sustainability issues
- * Name the principal natural resources used for energy generation and discuss the current geopolitics and economics related to each
- * Discuss public health and regulatory implications of energy distribution and usage by sector, such as transportation versus electricity generation (non-point sources vs. point sources of pollution)
- * Explain the basic science of renewable forms of energy and how they work
- * Understand how energy is used, by what sectors, and what factors are associated (e.g. buildings and electricity use - therefore building codes and regulated efficiency of windows available on the market etc. play a large role in US electricity consumption. Similarly, corporate average fuel economy of vehicles largely determines petroleum demand.)
- * Understand the ways in which energy generation, distribution and consumption is regulated in the US
- * Analyze the social, economic and political challenges that we face with regard to energy systems and infrastructure
- * Recognize the role of complexity in systems designed to generate, deliver and regulate energy
- * Discuss feasible options for various geographical regions in terms of energy sustainability, and the associated costs and tradeoffs involved
- * Articulate key aspects of current debates around energy security, present both sides of issues, and be able to make a strong argument for one plan of action, based on available evidence
- * Recognize and address normative aspects of the debate surrounding energy and sustainability
- * Explain differences between energy generation, regulation and consumption in different parts of the world, and how the US compares to other countries and regions
- * Describe what is taking place at the international level regarding multilateral agreements on climate and energy

B. Admissions criteria

List the admissions criteria for the proposed certificate. If they are identical to the admission criteria for the existing major and degree program under which this certificate will be established, please note that here.

3.0 GPA

C. Curricular structure

Provide the curricular structure for this certificate. Be specific in listing required courses and specify the total minimum number of hours required for the certificate.

Required certificate courses

Prefix	Number	Title	Is this a new Course?	Credit Hours
SOS/GCU	171	The Thread of Energy	No	3
SOS	314	The Science of Energy	Yes	3
SOS	315	Energy Policy	Yes	3
<i>Section sub-total:</i>				9

Elective certificate courses (students choose at least 2 courses from this list) However, electives are not limited to courses from this list only. Other courses on energy may come up (special topics, etc.) and students may get them approved as an elective for this certificate by their adviser. (Note: an * denotes more technical courses which may require more math and science knowledge or prerequisites)

Prefix	Number	Title	Is this a new Course?	Credit Hours
ALT	360	*Renewable Energy Technologies: Fundamentals and Integration	No	3
ALT	412	* Village Energy Systems	No	3
CHM	394	Topic: Chemistry, Energy and Society	No	3
EGR	371	Best Practices for Humanitarian Engineering	Yes	3
EGR	476	* Energy Infrastructures	Yes	3
EGR	494	* Topic: Design for the Developing World	No	3
ERM	494	* Topics: Energy Economics	No	3
GCU	364	Energy in the Global Arena	No	3
GCU	442	Geographical Analysis of Transportation	No	3
GLG	304	Minerals, Energy and Society	No	3
GPH	405	Energy and Environment	No	3
HST	306	Topic: Energy History	No	3
HST/PHI/SOS/BIO	394	Topic: History and Philosophy of Sustainability	No	3
JUS	332	Politics of Energy Policy and Justice	No	3
JUS	444	Environment and Justice	No	3
MET	435	* Alternate Energy Sources	No	3
PAF/SOS	394	Topic: Business, Sustainability & Public Policy	No	3
PHY	498	*Topic: The Science of Sustainable Energy	No	3
POS	394	Topic: Global Environmental Politics	No	3
PUP	430	Transportation Planning and the Environment	No	3
SOS	394	Topic: Introduction to Solar Energy for Non-Engineers	No	3

SOS/ATE	494	Topic: Renewable Energy	No	3
SOS	494	Topic: US Energy: Pathways to Sustainability	No	3
STS	317	Science, Technology and Global Engagement	No	3
STS	329	Cultivating Technology in Newly Industrializing Countries	No	3
STS	332	Global Issues in Science and Technology	No	3

Section sub-total: 6

Other certificate requirements

E.g. – Capstone experience, internship, clinical requirements, field studies, foreign language skills as applicable Credit Hours

Section sub-total: 0

Total minimum credit hours required for certificate 15

Minimum residency requirement
How many hours of the certificate must be ASU credit?
15

D. New Courses

Provide a brief course description for each new course.

SOS 314 - The Science of Energy.

The purpose of this new course is to provide the fundamentals of the natural and physical sciences of energy, so that students will be able to understand and explain the basics of energy in scientific terms. This course will be accessible to a wide variety of majors, and specific to energy. This course will help provide a basic understanding of principles that will enhance students' ability to understand material in SOS 315 and many of the elective options.

SOS 315- Energy Policy.

This course will introduce students to the complexities of how the production and consumption of energy are regulated in the US at the Federal, state and local levels. Students will identify energy stakeholders in the US and examine how they have shaped US policies around energy. The course will explain past and current US energy policies and identify how energy needs have shaped US relations with other countries. Students will also compare US energy policies to that of other countries in the world, as well as how Arizona's energy policies compare to other states within the US. It is best if students have already taken SOS 314 prior to this course.

Note: All new required courses should be submitted in Curriculum Changemaker and ready for Provost's Office approval before this certificate is put on Curriculum and Academic Programs Committee (CAPC) agenda.

4. Administration and Resources

A. Administration

How will the proposed certificate be administered (including admissions, student advisement, retention, etc.)?
 The School of Sustainability will administer this certificate.

B. Enrollment projections

What are enrollment projections for the next three years?

	1st Year	2nd Year (Yr. 1 continuing + new entering)	3rd Year (Yr. 1 & 2 continuing + new entering)
Number of Students (Headcount)	25	50	100

C. Resources

What are the resource implications for the proposed certificate, including any projected budget needs? Will new books, library holdings, equipment, laboratory space and/or personnel be required now or in the future? If multiple units/programs will collaborate in offering this certificate please discuss the resource contribution of each participating program. Letters of support must be included from all academic units that will commit resources to this certificate.

No new resources are needed

D. Primary Faculty

List the primary faculty participants regarding this proposed certificate. For interdisciplinary certificates, please include the relevant names of faculty members from across the University.

Name	Title	Area(s) of Specialization as they relate to proposed certificate
Martin J "Mike" Pasqualetti	Professor, School of Geographical Sciences and Urban Planning	Geography of energy, energy and environment, energy/water nexus, renewable energy development
Harvey Bryan	Professor, The Design School, Herberger Institute for Design and the Arts	renewable energy and architecture; energy efficient design; energy conservation; solar energy systems
Yueming "Lucy" Qiu	Assistant Professor in Resource Economics, Morrison School of Agribusiness and Resource Management	Energy & Environmental Economics, Energy Systems, Energy & Climate Policy Modeling
Clark Miller	Associate Professor, Department of Political Science, College of Liberal Arts and Sciences	Energy policy, energy and society
Don Burt	Professor, School Of Earth & Space Exploration	Minerals, energy and society
Agami Reddy	Professor, The Design School, Herberger Institute for Design and the Arts	Energy technology; Building environmental science
Christopher Jones	Assistant Professor, History, School of Historical, Philosophical, and Religious Studies	Energy transitions, energy history

5. Additional Materials

- A. Complete and attach the Appendix document.
- B. Provide one or more model programs of study (if appropriate).
- C. Attach other information that will be useful to the review committees and the Office of the Provost.

APPENDIX

OPERATIONAL INFORMATION FOR UNDERGRADUATE CERTIFICATES

(This information is used to populate the Degree Search/catalog website.

Please consider the student audience in creating your text.)

A. Proposed Certificate Name: Energy and Sustainability

Description (150 words maximum) **Students coming from any major who wish to gain a specialized knowledge about energy and society may apply. The courses are intended to provide a broad, interdisciplinary approach to energy issues such as how energy is currently generated for society, policy challenges and opportunities related to energy infrastructure and the major systemic changes we are likely to experience in our lifetimes. Courses on the science of energy are designed to be accessible to people from a variety of disciplinary backgrounds, from the social sciences and arts to the natural and physical sciences. This set of courses augments and complements studies in engineering, architecture, business, public policy, sustainability and other disciplines, giving students a specialization in energy (especially social and environmental aspects), regardless of their disciplinary training. This certificate program is meant to prepare students to utilize their education on energy in the workforce and enhance their employment opportunities.**

B. Contact and Support Information

Building Name, code and room number: (<i>Search ASU map</i>)	WGHL 108
Program office telephone number: (<i>i.e. 480/965-2100</i>)	480/727-6963
Program Email Address:	schoolofsustainability@asu.edu
Program Website Address:	http://schoolofsustainability.asu.edu/undergraduate/undergraduate-degree-programs.php

C. Program Requirements: Provide applicable information regarding the program such as curricular restrictions or requirements, specific course lists, or academic retention requirements.

There are no prerequisites for the required courses, and minimal prerequisites for a few of the electives.

Required certificate courses

SOS/GCU	171	The Thread of Energy (3)
SOS	314	The Science of Energy (3)
SOS	315	Energy Policy (3)

Section sub-total: 9

Elective certificate courses (students choose at least 2 courses from this list) However, electives are not limited to courses from this list only. Other courses on energy may come up (special topics, etc.) and students may get them approved as an elective for this certificate by their adviser. (Note: an * denotes more technical courses which may require more math and science knowledge or prerequisites)

ALT	360	*Renewable Energy Technologies: Fundamentals and Integration (3)
ALT	412	* Village Energy Systems (3)
CHM	394	Topic: Chemistry, Energy and Society (3)
EGR	371	Best Practices for Humanitarian Engineering (3)
EGR	476	* Energy Infrastructures (3)
EGR	494	* Topic: Design for the Developing World (3)
ERM	494	*Topic: Energy Economics (3)
GCU	364	Energy in the Global Arena (3)
GCU	442	Geographical Analysis of Transportation (3)
GLG	304	Minerals, Energy and Society (3)
GPH	405	Energy and Environment (3)

HST	306	Topic: Energy History (3)
HST/PHI/SOS/BIO	394	Topic: History and Philosophy of Sustainability (3)
JUS	332	Politics of Energy Policy and Justice (3)
JUS	444	Environment and Justice (3)
MET	435	* Alternate Energy Sources (3)
PAF/SOS	394	Topic: Business, Sustainability & Public Policy (3)
PHY	498	*Topic: The Science of Sustainable Energy (3)
POS	394	Topic: Global Environmental Politics (3)
PUP	430	Transportation Planning and the Environment (3)
SOS	394	Topic: Introduction to Solar Energy for Non-Engineers (3)
SOS/ATE	494	Topic: Renewable Energy (3)
SOS	494	Topic: US Energy: Pathways to Sustainability (3)
STS	317	Science, Technology and Global Engagement (3)
STS	329	Cultivating Technology in Newly Industrializing Countries (3)
STS	332	Global Issues in Science and Technology (3)

Section sub-total: 6

Total minimum credit hours required for certificate

15

D. **Additional Admission Requirements** If applicable list any admission requirements (freshman and/or transfer) that are higher than and/or in addition to the university minimum undergraduate admission requirements.)
Admission to this certificate requires a minimum GPA of 3.0.

E. **Delivery/Campus Information Delivery:** On-campus only (ground courses and/or iCourses)

Note: Once students elect a campus or On-line option, students will not be able to move back and forth between the on-campus and the ASU Online options. Approval from the Office of the Provost and Philip Regier (Executive Vice Provost and Dean) is required to offer programs through ASU Online.

F. **Campus/Locations:**

Indicate all locations where this program will be offered.

Downtown Phoenix Polytechnic Tempe West Other:



Daniel A. Buttry, Professor and Chair
Department of Chemistry & Biochemistry
Arizona State University
PO Box 871604
Tempe, AZ 85287-1604
Voice: (480) 965-2476
FAX: (480) 965-2747
email: Dan.Buttry@asu.edu
web: <http://chemistry.asu.edu/>

TO: Christopher Boone, Professor and Interim Dean
School of Sustainability

FROM: Daniel A. Buttry, Professor and Chair
Department of Chemistry and Biochemistry

DATE: September 19, 2013

RE: **Department Support for Undergraduate Certificate in Energy and Sustainability**

A handwritten signature in blue ink that reads "Daniel A. Buttry".

On behalf of the Department of Chemistry and Biochemistry (DCB), I am happy to provide this letter of support for the School of Sustainability's proposal to establish a new undergraduate certificate in Energy and Sustainability. Furthermore, I unreservedly support the use of our course Chemistry 394, Energy and Society as part of the curriculum for the new certificate.

September 22, 2013

Christopher Boone
Professor and Interim Dean
School of Sustainability
Arizona State University

Dear Dean Boone,

On behalf of the School of Geographical Sciences and Urban Planning (SGSUP), I am writing to voice our support for the School of Sustainability undergraduate certificate in Energy and Sustainability. This certificate centered in social and environmental dimensions of energy in a sustainability frame brings together ASU faculty across a range of fields.

This is a timely and unique certificate program that will serve ASU students in multiple fields and majors, as energy and issues of energy sustainability permeate nearly all facets of our lives, local to global. We believe the SOS-led energy and sustainability certificate complements our undergraduate majors in geography and planning, and we applaud especially the interdisciplinary thrust of the program.

We are pleased that members of the SGSUP faculty are contributing to the effort through teaching energy- and transportation-related courses, including Mike Pasqualetti who teaches one of the core courses in the certificate program, The Thread of Energy.

Do not hesitate contacting us should you need any additional input from SGSUP.

Yours sincerely,

Kevin E. McHugh
Associate Professor
Associate Director
kmchugh@asu.edu

From: [Christopher Boone](#)
To: [Richard Herrera](#); [Christopher Boone](#)
Cc: [Cameron Thies](#); [Candice Carr Kelman](#); [Caroline Harrison](#)
Subject: Re: attachment did not arrive
Date: Thursday, September 19, 2013 10:59:29 AM

Thank you for your letter of support.

Chris
Christopher Boone
Professor and Interim Dean
School of Sustainability
Arizona State University
<http://schoolofsustainability.asu.edu/>
<http://cgboone.personal.asu.edu>

From: Richard Herrera <Richard.Herrera@asu.edu>
Date: Thursday, September 19, 2013 10:58 AM
To: Christopher Boone <Christopher.G.Boone@asu.edu>
Cc: Cameron Thies <CAMERON.THIES@asu.edu>
Subject: Re: attachment did not arrive

Dean Boone,
The School of Politics and Global Studies has reviewed the certificate proposal from the School of Sustainability, "Energy and Sustainability" and support the proposed new certificate and the inclusion of the POS 394, Global Environmental Politics.

Richard Herrera

Richard Herrera
Associate Director, School of Politics and Global Studies
Director, Capital Scholars Program
University Coordinator, ASU-McCain Institute Internship Program
Associate Professor, School of Politics and Global Studies
Arizona State University
Tempe, AZ 85287-3902
Phone: 480-965-1331

On Sep 19, 2013, at 10:45 AM, Christopher Boone <Christopher.G.Boone@asu.edu> wrote:

Dear Richard,

The proposal document is attached. Thanks for taking the time to review it.

Best,
Chris
Christopher Boone
Professor and Interim Dean
School of Sustainability
Arizona State University
<http://schoolofsustainability.asu.edu/>
<http://cgboone.personal.asu.edu>

From: Richard Herrera <Richard.Herrera@asu.edu>
Date: Thursday, September 19, 2013 9:22 AM
To: Christopher Boone <Christopher.G.Boone@asu.edu>
Subject: attachment did not arrive

Dean Boone,
Im unable to open the attachment from the forwarded email from Cameron. Wold you please resend it to me.

Thanks,
Rick

Richard Herrera
Associate Director, School of Politics and Global Studies
Director, Capital Scholars Program
University Coordinator, ASU-McCain Institute Internship Program
Associate Professor, School of Politics and Global Studies
Arizona State University
Tempe, AZ 85287-3902
Phone: 480-965-1331

<Proposal_to_Establish_an_Undergrad_Energy_Certificate_September.docx>

From: [Christopher Boone](#)
To: [Nicholas Alozie](#)
Cc: [Candice Carr Kelman](#); [Caroline Harrison](#)
Subject: Re: Energy certificate
Date: Thursday, September 19, 2013 10:58:54 AM

Thank you Nicholas!

Chris
Christopher Boone
Professor and Interim Dean
School of Sustainability
Arizona State University
<http://schoolofsustainability.asu.edu/>
<http://cgboone.personal.asu.edu>

From: Nicholas Alozie <ALOZIE@asu.edu>
Date: Thursday, September 19, 2013 10:13 AM
To: Christopher Boone <Christopher.G.Boone@asu.edu>
Subject: RE: Energy certificate

Dear Chris-

Thank you for considering and including us in this exciting proposal. This is my letter of support urging that the proposal move forward.

Nick.

Nicholas O. Alozie, Ph.D.

Professor of Public Policy and Head
Faculty of Social and Behavioral Sciences
School of Letters and Sciences
Arizona State University - Poly Campus
7271 E. Sonoran Arroyo Mall - MC 2780
Mesa, Arizona 85212-6415
Phone: (480) 727-1395; Fax: (480) 727-1671
E-Mail: Alozie@asu.edu

From: Christopher Boone
Sent: Wednesday, September 18, 2013 5:54 PM
To: Nicholas Alozie
Subject: Energy certificate

Dear Nicholas,

The School of Sustainability is submitting a proposal to establish a new undergraduate certificate in

Energy and Sustainability. Could you please review the courses that we will be including and provide us with a letter of support?

We would like to include the following courses from your area as electives for the new certificate:

STS 317 Science, Technology and Global Engagement
STS 329 Cultivating Tech. in Newly Industrializing Cities
STS 332 Global Issues in Science and Technology

We need to submit this proposal by Monday so would need your letter of support by then. Please let me know if you need any further information.

Best,

Chris

Christopher Boone
Professor and Interim Dean
School of Sustainability
Arizona State University
<http://schoolofsustainability.asu.edu/>
<http://cgboone.personal.asu.edu>

04 February 2013

Dr. Candice Carr Kelman
Assistant Director
School of Sustainability

Dear Candice:

This letter is to attest that the School of Earth and Space Exploration endorses your plan to include our 3-credit undergraduate course *GLG 304—Minerals, Energy, and Society*—as one of the elective courses for your School's proposed new undergraduate certificate in Energy. We are happy to assist the School of Sustainability with this proposal to expand energy-related curricula for ASU undergraduate students.

With best regards,

A handwritten signature in black ink that reads "Steve Semken" with a long horizontal flourish extending to the right.

Steven Semken, Ph.D.
Associate Professor and Associate Director for Undergraduate Education
School of Earth and Space Exploration