

As part of the West Virginia University Board of Governor's Rule 2.2 Program Review process, the WVU Provost's Office required that a single Program Review Self-Study Form be completed on behalf of all identified programs in the department or unit. This Program Review Self-Study Form was to be submitted to the Provost's Office by end of day on August 1, 2023. The Provost's Office reviewed the submitted Program Review Self-Study Forms in early August.

Self-Study content is unvetted by the Provost's Office. As such, the WVU Provost's Office cannot attest to the accuracy of any data, analyses, or statements provided within. Also, redactions were made where warranted for the protection of individual identities around sensitive information.

Q1.1.
BOG Program Review Self-Study Form

This is the self-study form that will be completed in support of the summer 2023 academic transformation program portfolio review.

Only one program review self-study is to be submitted per unit; all of the unit's *programs* will be covered by one self-study.

Q1.2. Select the appropriate academic unit under review.

College
Department or School

Q1.3. List all of the unit's programs.

Example:

- BA Biology
- BS Biology
- MS Biology
- PhD Biology

Q1.4. Name and Email of the person completing the self-study

Name

Samuel Ameri

Email Address

samuel.ameri@mail.wvu.edu

Q1.5. How were faculty given the opportunity to contribute to, review and provide feedback on this self-study?

On July 10, 2023, Chair Ameri received the Faculty Notification Letter relative to the Academic Transformation/PNGE Self-Study. That same day, Chair Ameri distributed the letter to all PNGE faculty and staff along with a copy to Dean Mago and Dr. Slimak. On July 21, 2023, Chair Ameri distributed via email a completed draft copy of the PNGE Program Review Self-Study form to the PNGE faculty and staff strongly encouraging their input and feedback. The PNGE faculty and staff met on July 24, 2023, in-person and by zoom, allowing all faculty/staff to participate. The purpose of the meeting was to discuss the PNGE Self-Study and to provide any additional feedback. On July 28, 2023, Chair Ameri reviewed all PNGE faculty/staff feedback and made the necessary adjustments to the PNGE Self-Study form to be submitted to the WVU Provost's office.

Q2.1. Explain how the unit and its programs contributes to WVU's [mission](#).

This response is limited to 7500 characters, approximately 2 single spaced pages.

West Virginia University is committed to producing the highest quality research and the PNGE Department helps to fulfill this objective. In addition, the PNGE faculty excels in mentoring, educating, and preparing students to continue their studies within the WVU PNGE graduate and undergraduate programs. PNGE contributions to the University's R1 status come from both its Ph.D. and MS programs. WVU PNGE is one of only four petroleum and natural gas engineering programs in the United States and boasts some of the most cutting-edge laboratories available. The research conducted in these labs helps to increase national security, reduce dependency on foreign oil, maintain the country's position as the largest oil and gas producer in the world and generate graduates with advanced degrees. In our research, our PNGE faculty and graduate students explore many critical problems encountered in the field by the oil and natural gas industry related to drilling, completion, fracking, EOR and reservoir modeling topics. The Department consistently delivers advancements and solutions to industry partners to tackle these problems. We also remain at the forefront of artificial intelligence research, a position we have held for 29 years, long before other scientists and professionals in the oil and gas industry were particularly interested in the topic. Our faculty and students have spent considerable time and research efforts in recent years on the development of unconventional resources — a critical component of future extraction endeavors — and the Department is currently collaborating on a number of research projects with the Department of Energy's National Energy Technology Laboratory and industry partners. Because WVU is centrally located near major oil and gas fields, our undergraduate and graduate students have the opportunity to interact with many professionals currently working in the industry. Our faculty has developed close relationships with top industry personnel at companies such as Cabot Oil & Gas Corporation/Coterra, Dominion Energy, Northeast Natural Energy, CNX, Halliburton, Chevron, Baker Hughes, Schlumberger, Range Resources, EQT, Advanced Resources, Berkshire Energy, DOE-NETL and many more. The PNGE Department also works closely with international companies and almost all international PNGE graduates have positions waiting for them by sponsoring companies such as Saudi Aramco, ADNOC and Kuwait Oil Company. PNGE graduates are well-prepared to enter the workforce as petroleum and natural gas engineers. They are in high demand and earn some of the highest salaries of all WVU graduates. Some elect to continue their education and do just that in our Department at the master's and doctoral level.

Q3.1.
Resources, Revenue, and Expenses

The purpose of this section is to ensure the accessibility and adequacy of the unit's infrastructure and resources and its financial viability.

Responses in this section are limited to 7500 characters or approximately 2 single spaced pages.

Q3.2. Has the unit experienced significant issues with any of the following during the past five years?

By "significant," we mean issues that interfere with either the unit's ability to deliver its programs to its students or the students' ability to complete those programs in a timely manner.

	Yes	No
Ability to schedule required classrooms	<input type="radio"/>	<input checked="" type="radio"/>
Access to adequate technological infrastructure	<input type="radio"/>	<input checked="" type="radio"/>

Access to adequate technological support



Access to adequate physical infrastructure (labs, performance spaces, etc.)



Q3.3. Describe the issues the program has faced in the area(s) identified above.

This question was not displayed to the respondent.

Q3.4. Data have been provided on the unit's last three years of tuition revenue, expenses, and net revenue. Address any negative net revenue or any significant changes (positive or negative) to unit's net position.

Revenue by department is the actual tuition revenue, net of any discounting, paid by students taking courses in course subject codes affiliated with the department.

Expense by department is the actual unrestricted, operating expenditures by department within the functions of instruction and academic support.

Net revenue is the revenue minus the expense.

After careful examination of all available data, the Department has decided not to fill one PNGE faculty position vacated in May 2023. The workload normally assigned to this position as well as that assigned to another previously vacated faculty position in 2022, are distributed amongst the remaining faculty to improve instructional efficiency. This is a significant reduction, two members out of eight, or 25%, in the level of resources. Furthermore, the Department dedicated approximately \$123,000 from its PNGE WVU Foundation account for the salary of a current faculty member for academic year 2023-24. These actions were taken to minimize any greater negative impacts to our Department in light of current budgetary shortfalls and financial difficulty. It is important to note that there should be a critical mass of faculty to sustain ABET accreditation. Considering that the faculty workload also includes graduate-level instruction and supervision, the current number of the faculty minimally meet the ABET criteria. In addition, PNGE faculty are involved in the preparation of several on-line courses for the new Midstream Petroleum Engineering master's degree and certificate programs, and will be teaching these courses for the online graduate program as well as several courses for the planned Midstream Petroleum Engineering undergraduate minor. Furthermore, the PNGE undergraduate curriculum contains two courses — PNGE 200: Introduction to Petroleum and Natural Gas Engineering and PNGE 447: Introduction to Carbon Capture and Storage — which can be taken as an elective by students in other programs. In fact, many students in Statler College have taken PNGE 200 as a professional elective over the past decade. Additionally, PNGE 447 is a new course, and we expect that there will be significant interest by the students in other engineering programs, as well. In addition, we are offering a new elective course — Intro to Midstream Engineering — in the fall 2023 semester, which can also be taken as an elective by students in other programs. It should also be noted that the Department has generated more than \$1.70 million that is in a reserve state account, which is currently frozen. If this account is unfrozen, with the approval of WVU, we plan to use these funds over the next few years for: ● The salary of at least one full time faculty member. ● To provide stipends to our graduate teaching assistants. ● For financial support of student and faculty professional development. ● To recruit students to the PNGE department and WVU. ● To provide experiential opportunities to PNGE students. ● For laboratory upgrades and maintenance.

Because of lack of space, please note that the rest of this answer is inserted into the section (on the next page) labeled "Does this data capture all of the unit's research expenditures? If not, explain the difference here and provide evidence of additional research expenditures below".

Q4.1.

Faculty Composition and Productivity

Responses should be concise but also specific and supported by evidence. Responses in this section are limited to 7500 characters or approximately 2 single spaced pages.

Specific data definitions for these metrics are available on the [Academic Transformation](#) webpage.

Q4.2. Data have been provided on the unit's faculty full-time equivalency (FTE) to the median of all majors for fall 18 to fall 22.

Address any differences in the unit's student to FTE ratio and the institution's student-to-faculty ratio of 18-to-1 per IPEDS reporting for academic year 2021-2022.

Our success as a Department really comes down to the dedication and resourcefulness of our faculty and staff. As Department Chair, I appreciate their hard work and dedication to our students, to their research and to the dynamic industry we serve. Our renowned faculty consistently receive accolades and recognition and are regarded as experts in the field. They are active in research in a wide range of specialties within petroleum and natural gas engineering. The Department remains at the forefront of artificial intelligence and machine learning research, and both graduate and undergraduate programs benefit from this cutting-edge work. This curriculum remains quite attractive to potential students considering WVU. Our faculty also regularly publishes in referred journals as well as SPE conference proceedings, and has authored several books on petroleum AI and data analytics, carbon sequestration, coalbed methane and hydraulic fracturing, all within the last 3-4 years. Moreover, our faculty offers first-class teaching, hands-on training, and groundbreaking research in petroleum data analytics, reservoir engineering, drilling and production engineering, formation stimulation\ fracking, formation evaluation and other areas. It should be noted that the review of the provided data indicates that the ratio of program majors to full-time faculty for the BS PNGE program is above the median, but if the ratio is calculated using just the most recent years of data, the ratio is at the median. More importantly, based on the actual data that was collected, published, and shared by Stanford University, WVU PNGE is ranked as the No. 3 petroleum engineering department in the world, based on research productivity. It also identified WVU PNGE as the global leader in terms of work to apply AI solutions to petroleum and natural gas engineering concepts. If necessary, we can provide the data that was collected by Stanford University and how it was used to identify the ranking of petroleum engineering departments throughout the world.

Q4.3. This question is optional and required only if a unit's doctoral programs are under review.

Data have been provided on the unit's tenure-track / tenured FTE to doctoral student headcount ratio across all of the unit's doctoral programs.

Address any differences in the unit's doctoral student to tenure-track and tenured faculty FTE ratio to the institutional expectation of 2-to-1.

It should be noted that the tenure-track / tenured FTE to doctoral student headcount ratio for our Ph.D. program is above the median. When the new faculty size is considered, the ratio is even higher. Our Ph.D. program faculty FTE is intertwined with the master's degree program because graduate courses are common between our master's and Ph.D. programs. The PNGE master's program is already approved by BOG and any reduction in the Ph.D. program will have a negative impact on it thereby negatively impacting research productivity and graduate student recruitments. It is our understanding that the departments with \$1 million or more in research expenditures are exempt from the Ph.D. reviews. However, this metric ignores the number of faculty in the program. It is more difficult to reach this benchmark for the PNGE Department with its six faculty members, including the chair, as compared to a program with 17-30 faculty.

Q4.4. Data have been provided that show the changes to the unit's total number of faculty over the review period. Data have also been provided that show the total student headcount enrolled in all of the unit's programs over the same period of time as well as a three-year trend in student credit hour (SCH) production.

Explain the relationship between the change in the number of faculty in the unit and the change in the units total headcount enrollment and SCH production trends.

This question was not displayed to the respondent.

Q4.5. Data have been provided that shows the unit's research expenditures per the Higher Education Research and Development Survey (HERD).

Does this data capture all of the unit's research expenditures? If not, explain the difference here and provide evidence of additional research expenditures below.

In brief, the research expenditure for the PNGE department for 2020, 2021, and 2022 was \$285,317.90, \$406,846.92, and \$316,441.87 respectively, according to data from the Statler College business office. The PNGE department has always had several funded research projects each year. Currently, the department has five funded research projects and our faculty continue to collaborate on funded research projects with other departments at WVU, especially with Geology and Geography. A segment of our research expenditures is not reflected in the PNGE Department's specific research expenditures. The funding outside of the department is slightly over \$100,000 for 2023, and is managed by Geology and Geography. Additionally, research funds associated with endowments from the WVU Foundation are not included in the dollar amounts listed above.

Remaining answer to the question "Data have been provided on the unit's last three years of tuition revenue, expenses, and net revenue. Address any negative net revenue or any significant changes (positive or negative) to unit's net position...": Additionally, the PNGE Department has raised \$924,000 within the past seven months in support of the upcoming Midstream Engineering Program, as well as for naming rights of the midstream engineering lab by EQT. Additionally, there is more than \$3.5 million in cash and pledges for naming rights of the PNGE Department, with more to come. Furthermore, we have received well over \$400 million of in-kind contributions when considering the retail price for multiple software packages gifted to the Department, since the spring 2022 semester. Additionally, during the spring 2023 semester, the PNGE Department received the Halliburton Landmark software package with the retail price of well over \$120 million. All of these monetary donations are the result of our robust fundraising efforts within the Department. Furthermore, several proposals are still under consideration. These efforts and contributions are continuing. We hope that the current budgetary difficulty and transformation efforts would not result in a situation where we lose these tremendous financial opportunities that are available to us. These opportunities support our vision to make WVU PNGE fully independent of any greater financial need from University coffers and therefore, mostly immune to budgetary and financial constraints. All of these fundraising efforts, opportunities, and commitments (listed above) can be confirmed with the Statler College Dean and/or the development director. It is important to note that on July 20, 2023, the Department received a commitment for a new, multi-million-dollar contribution to the PNGE department. The Chair was asked to keep the information confidential allowing the energy company to make the announcement in a few weeks. However, the same information was also relayed by the company to WVU President, Dr. Gee. President Gee is well aware of this additional major contribution.

Q4.6. Upload evidence of research expenditures here.

[SMART Phase 1.pdf](#)

102.8KB

application/pdf

Q5.1.

Student Enrollment and Graduation History

Responses in this section are limited to 7500 characters (approximately 1.5 single spaced pages). Responses should be concise but also specific and supported by evidence.

Specific data definitions for these metrics are available on the [Academic Transformation](#) webpage.

Q5.2. Data have been provided on all of the unit's program's student enrollment trends.

That data includes:

4-year median fall enrollment (fall 18 through fall 21);

Fall 2022 change from 4-year median (in headcount and in percentage).

Units should address any programs with enrollment below the median for the program level or which has experienced a negative change in enrollment.

PNGE Department enrollment has declined for numerous reasons already alluded to in this document including the detrimental impact of the COVID-19 pandemic on the petroleum and natural gas industry and on our students both domestic and international, and as a result of the University's decision to leave the Academic Common Market. These enrollment challenges of the recent past are not a reflection of the general marketability of the PNGE program or its highly regarded reputation around the world. Nor should they be considered evidence of the Department's future appeal to undergraduate and graduate students, body of research, or service to the petroleum and natural gas industry and the citizens we serve as part of our land-grant mission.

Q5.3. Data have been provided on the unit's three-year trend in student credit hour (SCH) production.

Units should address any programs with a negative trend in SCH production.

SCH production is driven by enrollment in the program as discussed above. To improve the SCH production, the department is developing several on-line courses for the new Midstream Petroleum Engineering master's program (& certificate) as well as the planned Midstream Petroleum Engineering undergraduate minor. Additionally, PNGE 447: Introduction to Carbon Capture and Storage, is a new course which can be taken as an elective by students in other programs. We are also offering a new elective course — Intro to Midstream Engineering — in the fall 2023 semester, which can also be taken as an elective by students in other programs.

Q6.1.
Assessment of Learning and Program Improvement

The Provost's Office will review the self-studies from the most recent Board of Governor's five-year program reviews for this section.

Units may provide updated information below if they so choose.

Q6.2. Provide the unit's plans or ideas to make significant changes to its operations, structure, offerings, or personnel in order to reduce its costs or improve its efficiency.

Provide any significant changes to the department's program curricula, its assessment of learning practices, or any other improvements that have been made since the department's programs completed their most recent Board of Governor's five-year review.

Accreditation and ABET: Our Department was subject to a close review and scrutiny and earned a perfect accreditation for the maximum award period through 2028, without any shortcomings. The PNGE program has developed a detailed assessment plan implemented to evaluate student learning and "Student Outcomes." The results of the assessment are used for continuous improvement of the program. The faculty utilizes the course assessment results to enhance student learning in each course while the program implements the necessary modifications to our curriculum to keep it updated and attractive to students. The perfect accreditation from the Accreditation Board for Engineering and Technology, for the maximum award period through 2028, is indicative of the effectiveness of the assessment plan we have in place. It is very important to note that there should be a critical mass of faculty to sustain ABET accreditation. The current number of the faculty minimally meet this criteria.

Q6.3. The program may provide additional evidence of program improvement here.

Q7.1. The unit may provide any additional context or information about the unit's programs here.

Recently, the PNGE faculty have made significant changes to the graduate and undergraduate curriculums to reflect the current trends in the industry, particularly related to “Energy Transition,” which includes adding new graduate and undergraduate courses in “Carbon Capture and Storage”, “Data Analytics”, and “Intro to Midstream Engineering” to the PNGE curricula. These revisions and innovations in the curriculum will continue by adding topics such as “Geothermal” and “Hydrogen” in the future. We also continue to develop and introduce new courses to keep our curriculum up-to-date and to offer undergraduate research opportunities such as PNGE 297. In addition, the Department remains at the forefront of artificial intelligence and machine learning research, and our graduate and undergraduate programs benefit from this cutting-edge work as well as new courses on these topics for both the undergraduate and graduate curriculums. Department Role & Significance to the State: WVU Petroleum and Natural Gas Engineering is the only department of its kind in West Virginia and is one of only four petroleum and natural gas engineering departments in the country recognized by the Accreditation Board for Engineering and Technology (ABET). The Department’s presence in this region is critical and its continued operation is considered a priority in support of West Virginia’s history as one of the oldest oil and gas-producing states. It should be pointed out that the unconventional shale formations underlying the Mountain State are the largest domestic source of natural gas in the country. Well-trained petroleum engineers and improved extraction technologies produced by the Department are integral to fully develop these difficult-to-produce reservoirs. With its state-of-the-art laboratories and internationally respected faculty, PNGE helps solve many of the unique challenges currently facing the world’s oil and gas industry. Moreover, the PNGE Department plays a major role in the economic development of West Virginia and is aligned with the University’s mission as a 21 Century land-grant institution. The Department continuously aims to align itself with the mission of WVU: to deliver high-quality education, excel in discovery and innovation, model a culture of diversity and inclusion, and build pathways for the exchange of knowledge and opportunity between the state, the nation and the world. Currently, 53 of 55 West Virginia counties have oil or natural gas operations, and the state will remain a major source of clean, efficient energy for years to come. It should be noted that the oil and natural gas industry has contributed \$1.53 billion in severance tax dollars and \$1.33 billion in property tax dollars to the State since 2008. PNGE faculty serve the University community and the petroleum and natural gas industry whenever possible, such as on the WVU Faculty Senate, the Accreditation Board of Directors, Engineering Accreditation Commission, the International Organization for Standardization for Carbon Dioxide, the Society of Petroleum Engineers Innovative Teaching Committee, and as a sponsor of the North American Coalbed Methane Forums, and in leadership roles for many technical organizations. We also serve the citizens of this state and our nation, critical to the mission of a land-grant institution.

Q7.2. You may use this section to provide any additional evidence referenced in the program review.

Q7.3. You may use this section to provide any additional evidence referenced in the program review.

Q7.4. You may use this section to provide any additional evidence referenced in the program review.

Q8.1.

Thank you for completing your self-study for the West Virginia University Board of Governors program review. You may now submit the survey and your self-study will be passed on to the Provost's Office for review.

Location Data

Location: [REDACTED]

Source: GeoIP Estimation

