

Plan for SSCC Clean Technology Department

## **Plan for SSCC Clean Technology Department**

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## Executive Summary

South Seattle Community College is seeking permission to develop a new program in clean technology. That program will offer one new two-year degree in sustainable systems, and several certificate programs in four concentration areas within existing programs: energy, transport systems, green buildings and agriculture & hospitality.

These programs are being developed in part to respond to market demand for labor in these areas. The estimated clean technology labor market in the Seattle area over the next five years is:

Sustainable Systems	200 - 300
Energy	2,000 – 3,000
Electric Transportation	50 - 300
Green Buildings	325 - 1725
Agriculture & Hospitality	100 - 200
Total	2,675 - 5,525

The college is responding to the ethical, cultural and practical need for a workforce trained in the emerging, sustainability-driven challenges of the coming decade.

## Background

Clean Technology is not a single industry. Rather it is a sea change that is taking place over a wide range of industries, moving the entire economy towards a more sustainable basis. It represents an industry cluster, as described by the Prosperity Partnership<sup>i</sup>. South Seattle Community College (SSCC) is interested in accelerating this change by providing educational opportunities to students so that they can work effectively in this new economy. Sometimes this education is a niche market approach, requiring specific training, while in other cases it is an approach that will be integrated into all the programs that SSCC sponsors.

This approach to education embraces some very specific values, to wit:

- The natural world has value in and of itself.
- Economic activity should, to the greatest extent possible, protect the natural resources on which all life depends.
- All individuals should have access to family-wage jobs.

These values integrate well into SSCC's Mission:

*South Seattle Community College is a constantly evolving educational community dedicated to providing quality learning experiences which prepare students to meet their goals for life and work.*

SSCC has chosen to work with the Institute for Environmental Research and Education (IERE) to develop its Clean Technology Department.

A life cycle approach will underlie the clean technology department. The major concepts imbedded in this approach apply across sectors, and are summarized here.

1. Environmental and social issues need to be addressed in the context of systems analysis. Only if one looks at the big picture and how our personal and societal decisions affect the big picture will be able to make overall improvements.
2. Life cycle assessment and life cycle thinking about the products and services we produce and consume are essential analytical tools. They provide the fundamental linkage between our capitalist economy and the protection of people and the planet.
3. Our societal and personal value judgments are essential to move us forward: clarity in stating these values is essential. They tell us where we want to go.
4. Wherever possible, factual information and numerical analysis should be applied; this is the best way to support the values we hold. Analyses using the best available facts help assure that we get to the outcomes we seek.
5. It is possible and desirable to extract from these analyses relatively simple rules to guide action and learning in particular industry sectors. These should guide education for those sectors.

SSCC will develop an academic degree in sustainable systems, starting with a three credit introductory course that will be available to all students as an elective.

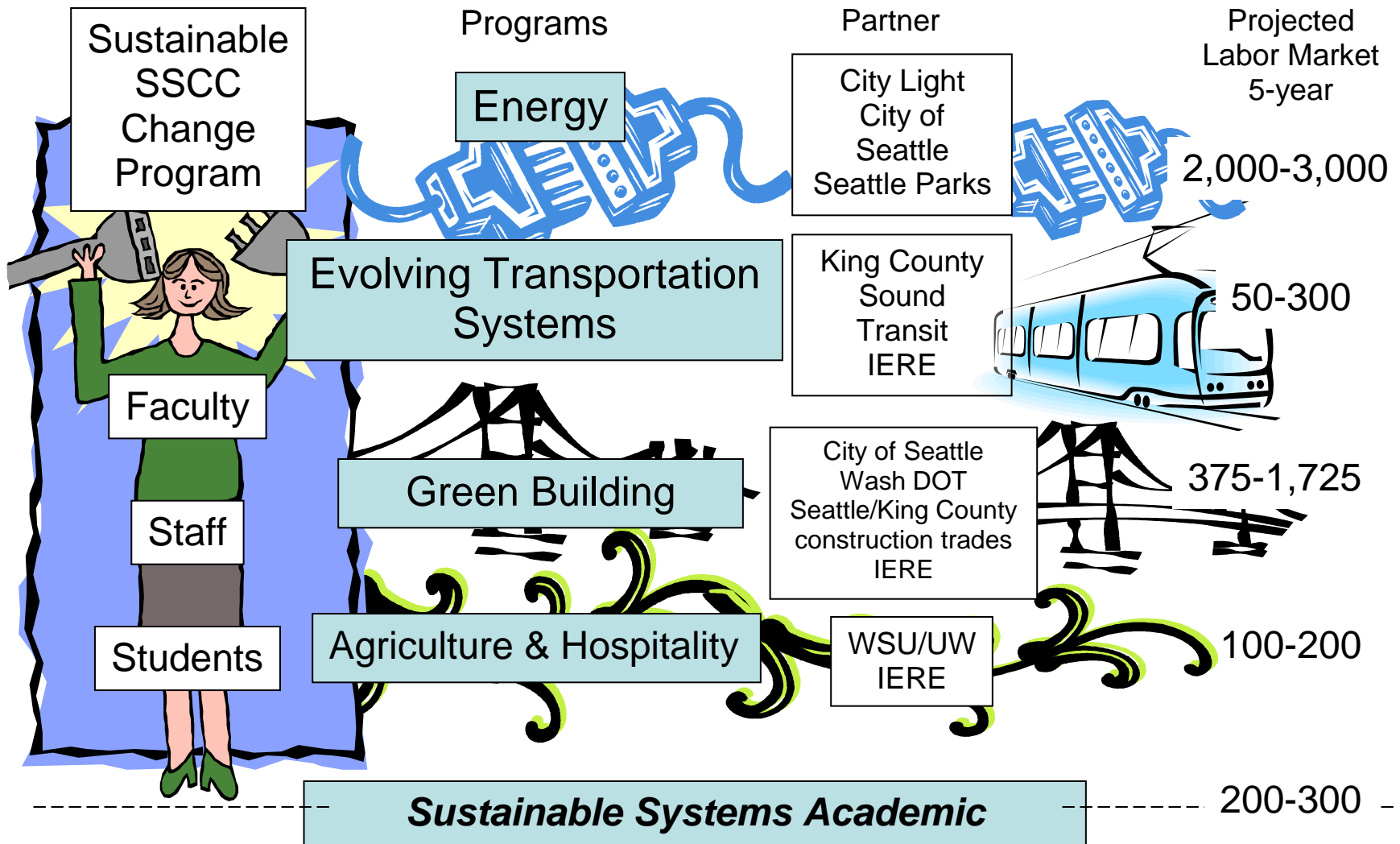
The majority of environmental impacts of our economy derive from relatively few industry sectors: energy, agriculture, transportation and buildings. SSCC already has departmental programs in each of these sectors and its clean technology department will span these programs, developing certificate programs that will be valid in both the clean technology and the applicable sector-specific departments. All students will be educated on the basics of clean technology and how they apply to their chosen fields of study. Certificate programs will be developed to provide technology-specific training. For example, certificate programs will be provided in energy auditing and in sustainable viticulture.

In summary the development of the Clean Technology Department will have three elements:

1. A change management program for faculty and staff to give them the capacity to integrate sustainable systems thinking into their work;
2. A new two-year degree in sustainable systems; and
3. Many certificate programs and classes throughout the college curriculum that will develop the specific skill sets appropriate to the different careers that students are pursuing. These will focus on energy, transportation, green building and the agriculture/food services industrial sectors.

This structure is laid out in the graphic on the next page.

**Clean Technology Department Structure & Connections**



## **Specific Programs**

### ***SSCC Change Program***

This program will provide the management systems necessary to assure that sustainability is integrated into all the college operations and curricula, becoming the driving force behind all the college's efforts.

### **Background**

SSCC has committed to becoming the clean technology campus in the community college system. This commitment is necessary but not sufficient for the development of capacity to deliver this program. More important, a comprehensive program of faculty and staff education and involvement will be necessary to accomplish the interdisciplinary but integrated approach. The campuses will have to walk the talk, and this means a sea change in the college to match the sea change in the economy that clean technology represents.

The change has already begun as the staff and faculty have been hearing the buzz about this planned change. Now a more thoughtful and comprehensive approach must be undertaken to assure that everyone knows his or her part, has the knowledge and tools to accomplish it and is rewarded for efforts that support the clean technology goal of the college.

This change program for the college is the engine for the entire clean technology program. It is the interest and creative energy of the faculty and staff that will make the new program a success.

### **Planned Change Programs**

#### ***Faculty***

- Mandatory half-day training on sustainable systems in the context of the educational programs
- Assistance with developing course materials
- Follow-up on student acceptance and learning of course changes via student evaluations of the class
- Integration of sustainability in employment contracts via rewritten course descriptions

#### ***Staff***

- Mandatory training (2-4 hours)
- Development of department metrics for sustainability
- Quarterly reports on progress
- Integration of sustainability in annual reviews

## ***Sustainable Systems Degree Program***

### **Background**

This academic program is designed to prepare students for the sustainability management field. Students will learn how to perform systems analyses, and how to measure system performance using tools such as life cycle assessment and life cycle costing. They will learn how to identify best opportunities for environmental improvement. And they will learn management techniques and influence management methods for accomplishing their goals.

### **SSCC Capacity**

The building and classroom infrastructure exists to teach this program, but investment in software and library resources will have to be made to bring this program to reality. A significant portion of this effort will depend on the relationships that SSCC has built with industry, government and NGO's working in this area.

### **Potential Job Market**

The sustainability field is exploding. About five newly created jobs per month are posted in the Seattle area, and nationwide the numbers are in the hundreds. We estimate that at least 250 new jobs will be created in the Seattle area over the next five years.

### **Student classes**

- Introduction to sustainable systems
- Environmental management systems
- Systems analysis I & II
- Influence management
- Change management
- Technical writing
- Life cycle assessment I, II, III
- Life cycle management
- Introduction to energy systems
- Introduction to water systems
- Environmental accounting
- Environmental sampling & statistics
- Principles of biogeochemistry

Prerequisites: one year of chemistry, one year of biology, computer literacy and proven facility with spreadsheets.

## **Energy**

### **Background**

The use of fossil fuels is the source of many of our environmental problems. Climate change, acid rain, photochemical smog, eutrophication, pollution of water and soils with polyaromatic hydrocarbons and airborne particulate matter all derive directly or indirectly from the combustion of fossil fuels. It follows, then, that minimizing or eliminating the use of fossil fuels will have a substantial positive impact on both human and ecological health. Additional benefits are derived from supporting local economies and reducing the cost of living, as well as from reducing the reliance on foreign oil.

### **SSCC Capacity**

A sustainable energy future means both reducing energy consumption and increasing the production of renewable energy. SSCC has apprenticeship programs with the IBEW and with several other unions involved with energy installations and building retrofits, including the marine electricians, sprinkler fitters and others. SSCC has already offered one class in energy auditing, the first of three leading to certification of energy auditors using a national certification body. The full three courses will be offered in early 2007. IBEW training also includes training on the installation of solar panels. This training will be upgraded to conform to the standards of Solar Energy International.

### **Potential Job Market**

A related issue is the installation and maintenance of energy efficient HVAC systems. The Bureau of Labor Statistics states “employment of heating, air-conditioning, and refrigeration mechanics and installers is projected to **increase faster than average** for all occupations through the year 2014”<sup>ii</sup> They further state that

*Concern for the environment has prompted the development of new energy-saving heating and air-conditioning systems. An emphasis on better energy management should lead to the replacement of older systems and the installation of newer, more efficient systems in existing homes and buildings. Also, demand for maintenance and service work should increase as businesses and homeowners strive to keep increasingly complex systems operating at peak efficiency. Regulations prohibiting the discharge and production of CFC and HCFC refrigerants should continue to result in the need to replace many existing air conditioning systems or modify them to use new environmentally safe refrigerants. The pace of replacement in the commercial and industrial sectors will quicken if Congress or individual States cut the time needed to fully depreciate the cost of new HVACR systems, which is being considered.*

We estimate that the total potential job production in the Puget Sound region for this program is about 10,000 jobs over the next decade, based on a study by IERE<sup>iii</sup>. Within the next five years, that number will be smaller, in the 2000 to 3000 range.

## **Planned Programs**

### Planned Certificate Programs

- Energy Auditor I, II, III
- Solar PV Installation
- Installation and Maintenance of Heat Pumps
- Insulation Retrofits
- Cleaning and maintaining heating ducts
- Installation of energy monitoring equipment
- Wind turbine installation & maintenance

## ***Green Buildings***

### **Background**

About 85% of the environmental impact of buildings comes during the operations and maintenance phase of the life cycle. SSCC has developed a one-credit course in green building maintenance, which has been provided to 90 employees of the Seattle Parks department. The green building maintenance program recognizes the primary sources of environmental impacts of buildings, to wit:

- Water use and abuse
- Energy wastage
- Toxics use and mismanagement

Of course, the original choices of how a building is designed and built have a large impact on how a building operates. Understanding the impacts of their choices on the operating phase of buildings will be integrated into the masonry, glazing, paints and allied trades and other building apprenticeship training programs in the SSCC building portfolio.

### **SSCC Capacity**

SSCC is the largest educator of union apprentices in the state, and it has an especially large presence in the building trades including:

- Boilermakers
- Cement Masons
- Linemen
- Electricians
- Floor covering
- Glaziers
- Iron Workers
- Masonry
- Painters
- Sprinkler Fitters

Half the building trades apprentices in the state pass through SSCC's programs. Each of these trades has an important part to play in accomplishing more sustainable future, and thus have opportunities for employment.

## Potential Job Market

The City of Seattle<sup>iv</sup> estimated that in 1994, the sustainable building and construction employment was between 377 and 1724 (median 1095). This represents 7 to 8 percent of the total employment of these sectors. The green building sector is increasing, as noted in the City's report, "Both nationally and in the City of Seattle there is a strong upward trend in Sustainable Building activity."

Although the City's report did not specify an ultimate level of demand for these services, it is not unreasonable to assume that the construction and trades employment in this area could double within five years. Ultimately building green will simply be the way things are done, and tradespeople without the necessary skills will be pushed out of the commercial and possibly the residential construction market.

## Planned Programs

Certificate training will be provided in:

- Green building maintenance
- Selection and installation of permeable concrete
- Installation of interlocking pavers
- Installation of double and triple-paned windows
- Installation of insulation in new building construction
- Installation of in-floor radiant heating systems
- Green plumbing
- Green Heating systems design and installation
- Retrofitting buildings for energy efficiency

## ***Evolving Transportation Systems***

### **Background**

Perhaps the most critical sustainability issue in the world today is the use of petroleum products to power our transportation systems. Not only are the emissions affecting our air and water, but the cost of oil will only rise as the total world resource becomes depleted.

Addressing this issue in the Pacific Northwest means developing transportation powered by electricity and biofuels. Seattle Biodiesel is planning on building a 100 million gallon/year biodiesel manufacturing facility in Grays Harbor County, and a large portion of those sales will be in the Seattle area.

### **SSCC Capacity**

Recognizing this trend, SSCC joined the Advanced Vehicle Initiative<sup>v</sup>, whose goal is to produce alternative vehicles in Washington State. SSCC is well suited to lead this effort in the Seattle area, because it supports programs in marine engineering, DOT training, large diesel engines and car repair and maintenance.

### **Potential Job Market**

In 2006 the sales of hybrid vehicles in the US approached 200,000<sup>vi</sup>. Almost half these sales were Toyota Priuses. This year, for the first time, Washington State public agencies bought more Toyota Prius cars than conventional cars<sup>vii</sup>, and the purchase of hybrid cars by individuals far outweighs these fleet sales.

SSCC has already been approached by the City of Seattle fleet manager and by Sound Transit to develop training programs for their maintenance technicians working with electric drives. Both large electric drives (in trains) and small ones (in hybrid vehicles) are essential to a sustainable transportation system.

The Department of Labor Statistics says of automotive repair technicians, “Job opportunities in this occupation are expected to be very good for persons who complete automotive training programs in high school, vocational and technical schools, or community colleges as employers report difficulty in finding workers with the right skills.”<sup>viii</sup>

All these events lead one to the conclusion that the labor market for electric transportation and alternative fuel maintenance technicians must rise over the next several years.

## **Planned Programs**

In conjunction with the existing programs, the clean technology department will be offering certification programs in:

- Hybrid car repair and maintenance
- Electric motors for transport systems
- Battery systems and retrofits
- Fuel cells
- Automotive emissions
- Regenerative Braking
- Alternative fuel vehicles

## ***Agriculture & Hospitality***

### **Background**

Agriculture has broad environmental impacts that are different from the impacts of other industries. By definition, agriculture displaces a natural ecology with an artificial and necessarily impoverished ecology. Conventional agriculture makes extensive use of fossil fuels, artificial fertilizers and pesticides, and irrigation water. Then the foods are transported, processed, retailed and prepared. These phases of the lifecycle of food also have their environmental impacts, especially as they relate to energy use, water pollution and waste management.

Teaching students about the environmental impacts of their choices, and engaging them in efforts to decrease those impacts as a life-long goal will lead to better outcomes in our food systems. They will also give them an edge in the job market, for as noted below, sustainable agriculture is one of the few bright spots in the agriculture and food markets.

### **SSCC Capacity**

SSCC has programs in the agricultural sector that encompass

- Meat cutting
- Horticulture
- Viniculture and oenology
- Culinary Arts

We have begun working in this sector by training 60 meat cutting apprentices on the environmental impacts of agriculture, the environmental impacts of meat cutting and sales, and the actions they can take in reducing those impacts. The opportunities here encompass environmentally preferable purchasing and water and energy conservation during meat preparation and storage.

Similar sorts of educational opportunities will be offered to the other agriculturally related programs.

### **Potential Job Market**

According to the Bureau of Labor Statistics,

*Despite the expected continued consolidation of farmland and the projected decline in overall employment of farmers, ranchers, and agricultural managers, an increasing number of small-scale farmers have*

*developed successful market niches that involve personalized, direct contact with their customers. Many are finding opportunities in organic food production, as more consumers demand food grown without pesticides or chemicals. Others use farmers' markets that cater directly to urban and suburban consumers, allowing the farmers to capture a greater share of consumers' food dollars. Some small-scale farmers belong to collectively owned marketing coöperatives that process and sell their product. Other farmers participate in community-supported agriculture coöperatives that allow consumers to directly buy a share of the farmer's harvest.*

*... In addition, growing demand for horticulture products, such as flowers, ornamentals, trees, shrubs, and other nonedibles, is expected to produce better employment opportunities for greenhouse and nursery farmers and managers.*

The City of Seattle Sustainable Building Cluster Study identified a median of 86 agricultural services positions within that cluster, but there are many more potential jobs available through the hospitality cluster. We have made a conservative estimate of between 100 and 200 new agriculture & hospitality jobs available in the Seattle area within the next five years.

## **Planned programs**

We intend here that the programs will primarily be integrated into existing programs. Initially, each program will have program materials tailored to the student's needs, as was done for the meat cutters.

However, there are several agriculture and viniculture certification programs. Classes will be offered to teach the students about the elements of these programs, preparing them to achieve certification at their places of work.

Specific classes and certifications will be offered, including

- composting
- anaerobic digesters for food and farm waste
- wet gardens
- dryscaping & hardscaping
- green roofs
- enhancing wetlands
- environmental restoration
- "fix it" gardening
- sustainable viniculture
- preparing for organic certification

## Plan for SSCC Clean Technology Department

*This Plan was funded by a grant from the Russell Family Foundation and by a grant from the City of Seattle.*

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<sup>i</sup> <http://www.prosperitypartnership.org/>

<sup>ii</sup> <http://www.bls.gov/oco/ocos192.htm#outlook>

<sup>iii</sup> <http://iere.org/documents/EnergyIndependentCommunities-10yearplan.pdf>

<sup>iv</sup> City of Seattle, Sustainable Building Cluster Study. February 2004.

<sup>v</sup> <http://www.plugincenter.com/>

<sup>vi</sup> <http://www.electricdrive.org/index.php?tg=articles&topics=7>

<sup>vii</sup> [http://access.wa.gov/news/2006/Sep/n2006818\\_2486.aspx](http://access.wa.gov/news/2006/Sep/n2006818_2486.aspx)