

# Advisory report

Finding the right spot for a better future

Alaska, Washington State, Oregon or California

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## Introduction

We are a group of five students from the Hanze Hogeschool. What makes us strong is that we are an innovative, young and very motivated team. We made this report because this semester's theme is energy and we would like to apply our study and knowledge in practice. We would like to thank Peter Room for his support and help for making this report and we would like to thank all our references for releasing their information that we could use.

This report is about the place of a sustainable energy park. We would like to help the world to be CO2 neutral by advising investors by building a windmill-, solar panel- or biomass park. This report serves as information bundle for people that want to invest in sustainable energy.

We are discussing 4 different countries and judge them based on multiple criterium points. By judging the different countries on the same criterium points we can find out which country is best for placing the installations. So at the end we will advise in which country you can place the best windmill park, solar park or biomass park.

Groningen  
7-4-2017

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## 1. Introduction

This report is about sustainable energy. Sustainable energy means energy that is produced on an environmentally friendly way, so where CO<sub>2</sub> emission is not very high or even CO<sub>2</sub> neutral. This project is based on building a new windmill-, solar panel- or biomass park. Our research is about four different countries which we will investigate on multiple criterium points. By using the same criterium points with every country we can find out which country is best to build an installation. All the criterium points are based on the DESTEP Theory. With this theory we will investigate 6 main subjects which will be divided in criterium points. The six subjects are Demographic, Economic, Social, Technological, Ecological and Political. Every information that we collected is based on official references.

We as a group would love to help the world and investors with building a new park for producing energy on a sustainable way. During our study we are busy with every kinds of energy and we would love to apply our knowledge in this advisory report.

This report will start with the *central question and research approach*. In this chapter we will talk about our central question, this is the most important question of our report because the whole report is based on this question. Besides that there will be told about the report approach, how did we get our results? After the central question the results of our research will be showed with argumentation and description in the chapter *Results and analysis*. In the last chapter the main advisory and recommendation will be showed, in this chapter we will advise the investor about the best country to invest for your sustainable energy installation.

For placing the installations we had four countries to choose: Alaska, California, Washington state and Oregon.

## 2. Central question and research approach

The central question for our report reads as follows:

*Based upon a thorough external and internal analysis, which combination of market and products would be the best fit with HSE's ambitions and capabilities?*

The whole report is based on this question. We would like to find the best placement but that's not all, we would also like to explain why we think this is the best place.

To find out what's is the best answer on our central question, we had to do research. We started our research with finding more information about sustainable energy, so we asked ourselves: what's the most important parts of building a sustainable energy installation. After we brainstormed about this information we could formulate our criterium points. These points will determine at the end which country will be chosen as best with the external alayse.

This report is mainly based on the DESTEP method, with this theory we could divide the criterium points and find out the best way to find the best place.

After the DESTEP method and the internal analysis we were able to make a SWOT analyse of our company and find the optimum way.

### 3. External analyse

For the external analyse we divided the different countries and researched them based on the DESTEP method.

#### 3.1. Alaska

##### Economic

Economic				
	Windmills	Costs of building	10	2
		Costs of Maintenance	8	1
		Revenues	10	3
		Economical situation	Go/ No Go	Go
	Solar panels	Costs of building	10	1
		Costs of Maintenance	8	1
		Revenues	10	0
		Economical situation	Go/ No Go	Go
	Biomass	Costs of building	10	3
		Costs of Maintenance	8	3
		Revenues	10	2
		Economical situation	Go/ No Go	Go

##### Windmills

###### **Costs of building**

The costs of building of windmills has to do with many factors. The build of a commercial wind turbine range from about 1.3 million to 2.2 million per MW of nameplate capacity installed. Now a days the average wind turbine are installed at 2 MW.

[http://www.windindustry.org/how\\_much\\_do\\_wind\\_turbines\\_cost](http://www.windindustry.org/how_much_do_wind_turbines_cost)

###### **Cost of maintenance**

The average cost of maintenance are on average 3 % of the original cost of the turbine. This is a international taken average.

Sources:

<http://www.windmeasurementinternational.com/wind-turbines/om-turbines.php>

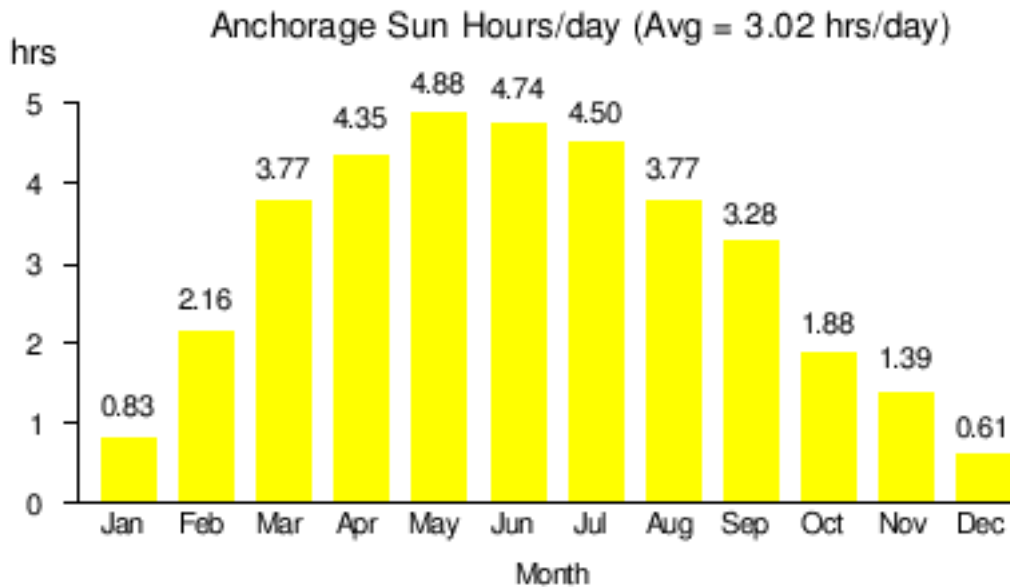
###### **Revenues**

- The revenues of a windmill farm depended on the wind that will blew. Looking to Alaska, you can make a lot of profit.
- When we look at Eva Creek Wind project, this is a windmill farm project that was build in Alaska. 12 Senvion turbines of a height of 80 meters and the rotor diameter of 92.5 meters were build. These windmills will generate power if the wind speed is 6.7 mph (10.78 km/h) and can generate power till maximum wind speed 53.7 mph ( 86.42 km/h). The total project cost were \$ 93 million. The estimated average annual capacity factor for the wind farm is 36%
- On this date Eva Creek Wind Farm produced 279,364 kWh of a possible 590,400 kWh.

Source: <http://www.gvea.com/energy/evacreek>

### **Solar Panels**

The most important factor before installing solar panels are the hours of sun each day. Below you can find the average sun hour/day. This average is very low,



Source : NREL Average Sun hour/day Alaska 2012

### **Revenues**

- Are too low because, the average sun hours/day are very low.

### **Biomass**

Alaska's most important biomass fuels are wood, sawmill wastes, fish by-products, and municipal waste.<sup>1</sup>

### **Costs of building.**

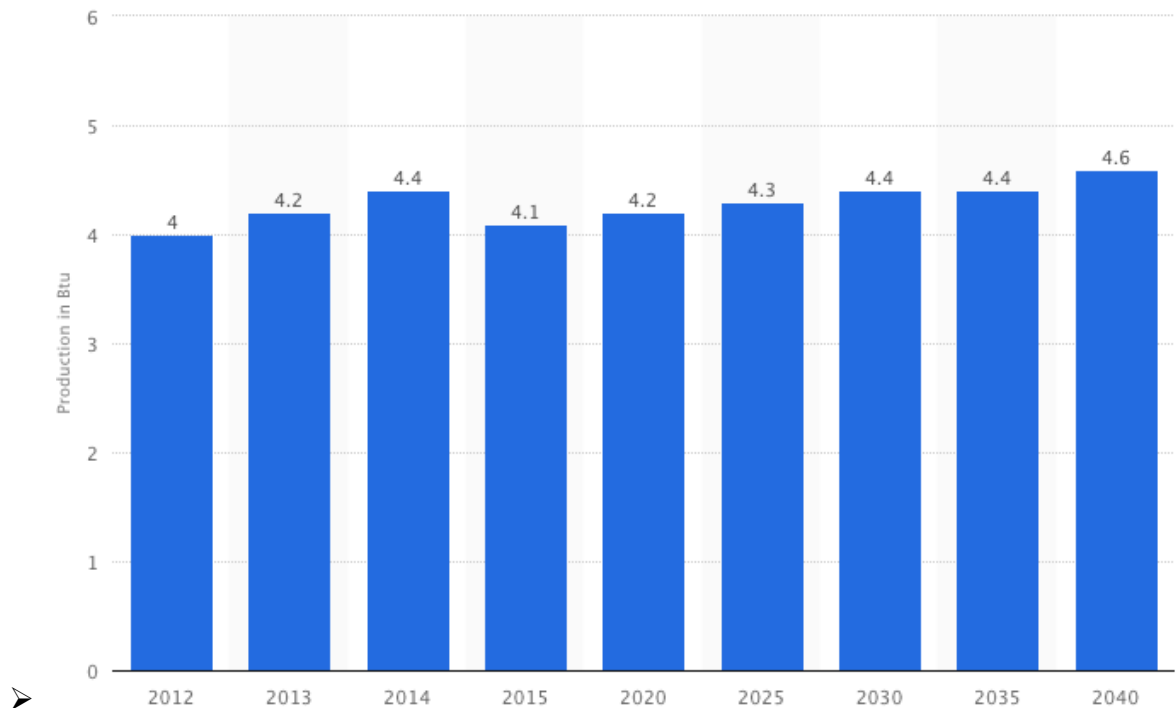
The building of a biomass stove/generator is not expensive at all, the important factor is that there is enough fuel to generate power.

### **Revenues**

- The biomass industry is a growing industry. Below you can find the total expectation in 2040. ( in British Thermal Units)

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<sup>1</sup> <http://www.akenergyauthority.org/Programs/AEEE/Biomass>



Source : <https://www.statista.com/statistics/264029/us-biomass-energy-production/>

### **Economic situation Alaska**

The economic situation of Alaska can be defined if a growing economy. The GDP (gross domestic product) is \$49,120,000,000. This means that the GDP per capita \$ 44,174 is, the GDP per capita of Alaska is a bit lower than the average capita in the country.

Source: <https://fred.stlouisfed.org/graph/?id=AKNGSP>

### **Social**

Social					
	Windmills	Local residents	View	2	2
			Noise	2	2
	Solar panels	Local residents	View	2	3
			Noise	2	3
	Biomass	Local residents	View	2	3
			Noise	2	3

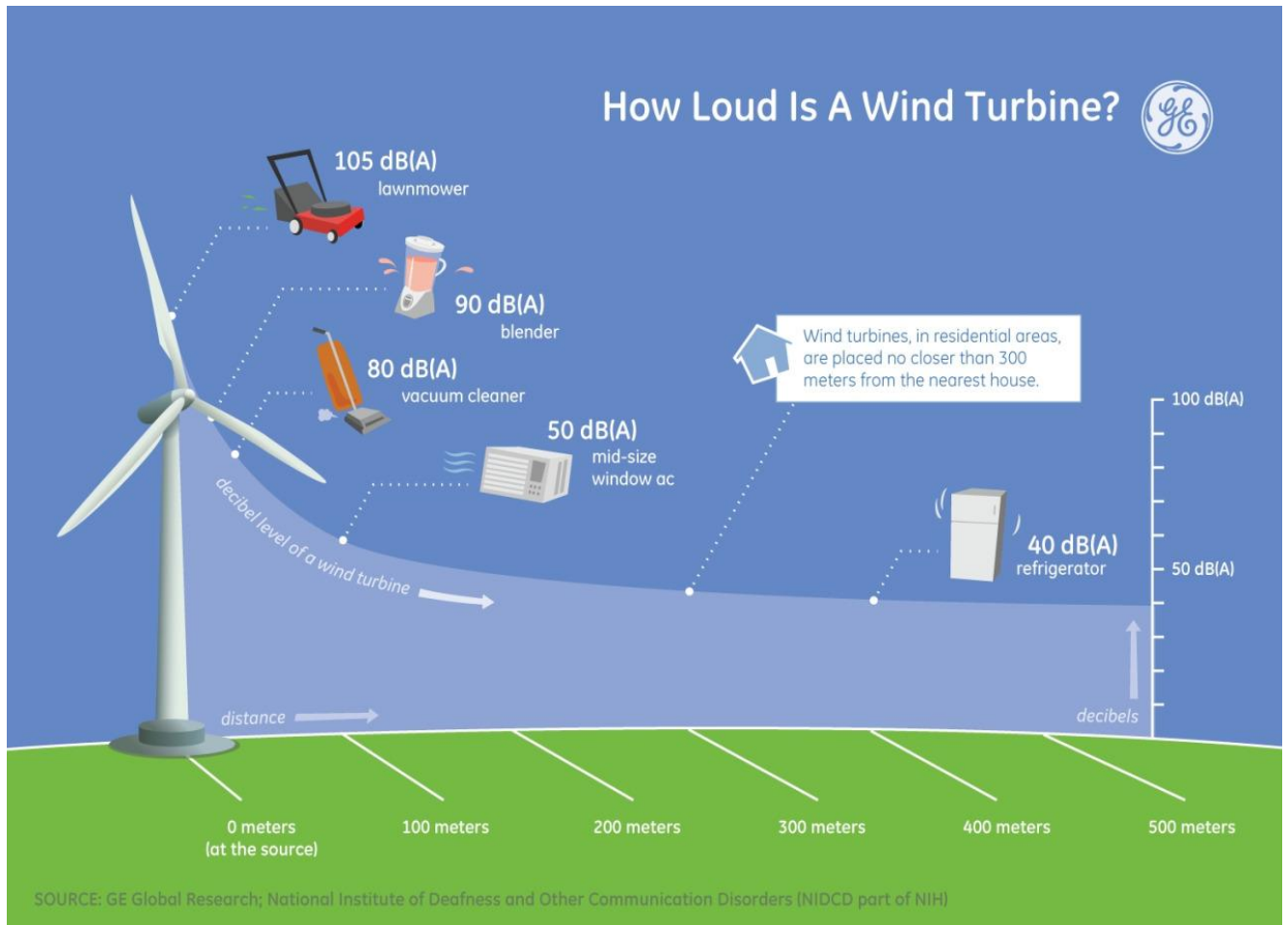
### **Windmill view and noise**

Windmills, are big and long aluminum tubing's that are standing in the nature, anyway it is important that there is nothing in front of the windmills so the windmill can produce more efficient. In most cases the windmills will be build in nature areas, because there are no large buildings and there is a possibility to build them close to the coastline. The building of windmills close to nature areas or coastlines can negatively effect the tourism sector.

The noise that windmills make is dependent of how close you stond to the windmill. In the figure below you can see how much db you will here at which distant.



Figure 1: How loud is a Wind Turbine



Source: <http://www.gereports.com/post/92442325225/how-loud-is-a-wind-turbine/>

### **Solar panels view and noise**

Solar panels are not view disturbing products, the reason for this is because often they are on places which are not used for something else, like a roof of a house. Solar panels laying in an open field, will also not provide for views, you can look over it. Solar panels can even look very orderly and neat in a solar panel field.

Solar panels themselves are not making noise that will disturb, but the central can be a bit noisy.

Source : <https://www.solarchoice.net.au/blog/solar-inverter-decibel-levels-do-solar-farms-make-noise/>

Technological				
	Windmills	Innovation	2	2
		Possibility to build	Go/No Go	Go
		Possibility to turn	50	2
	Solar panels	Innovation	2	3
		Possibility to build	Go/No Go	Go
		Possibility to turn	50	3
	Biomass	Innovation	2	3
		Possibility to build	Go/No Go	Go
		Possibility to transport	30	2
		Access to water	50	3

Ecologist				
	Windmills	CO2 Revenue	Wind speed	15   1
	Solar panels	CO2 Revenue	Hours of Sun	15   1
	Biomass	CO2 Revenue	Quantity of biomass	10   3

Political	Windmills	Legislation	20	2
		Influence government	4	2
		War	Go/No Go	Go
	Solar panels	Legislation	20	3
		Influence government	4	3
		War	Go/No Go	Go
	Biomass	Legislation	20	3
		Influence government	4	3
		War	Go/No Go	Go

## 3.2. California

### Economic

#### Windmills, Solar panels & Biomass.

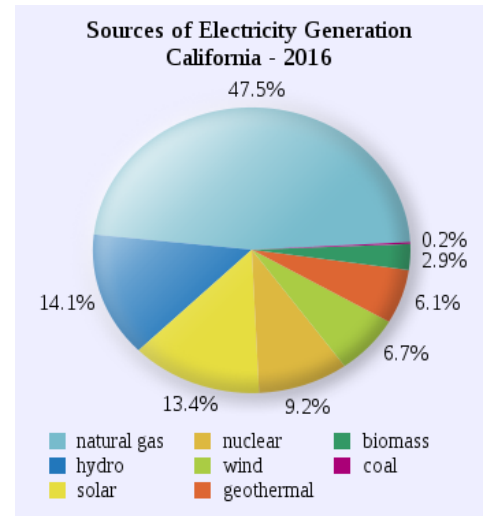
#### Costs of building

the average annual mean wage of construction: \$37,890.  
In California the construction workers get paid 27% above the average of the states. Their annual wage is 43,670.

Sources:

<https://www.bls.gov/oes/current/oes472061.htm>

<https://www.indeed.com/salaries/Construction-Worker-Salaries,-California>



#### Costs of maintenance

There should not be any maintenance cost difference between costs of maintenance in different states. The only main difference could exist in the difference average wages of maintenance workers.

#### Revenues

California is busy trying at being the best renewable energy source country of the states. It has a lot of different tactics on how to do this and has a lot of money to spend on research and development of sustainable energy. Therefore the state will be very good for sales at sustainable energy products.

Sources:

<http://www.energy.ca.gov/renewables/>

Economic			
	Windmills	Costs of building	1
		Costs of Maintenance	2
		Revenues	3
		Economical situation	Go
	Solar panels	Costs of building	3
		Costs of Maintenance	3
		Revenues	3
		Economical situation	Go
	Biomass	Costs of building	2
		Costs of Maintenance	2
		Revenues	2
		Economical situation	Go

## Social

### View & Noise

California has five windmill parks, all of them are in the desert so nobody is bothered by the view or noises and here they tend to work at their best. For solar panels and biomass there arent any complaints.

Sources:

[https://en.wikipedia.org/wiki/Wind\\_power\\_in\\_California](https://en.wikipedia.org/wiki/Wind_power_in_California)

Social				
	Windmills	Local residents	View	2
			Noise	2
	Solar panels	Local residents	View	2
			Noise	2
	Biomass	Local residents	View	2
			Noise	2

# Technological

## Innovation

For windmills, California is the 2th state in the states when we look at installed wind capacity. It's not surprising that California is a leader in any renewable energy market. The rapid growth of the industry has been surprising, though. Since 2002, wind capacity in the state has doubled. The industry began in the 1980s has a number of massive installations, including the 1020 MW Alta Wind Energy Center. When we start speaking of solar power California is way a head of the whole states. They produce 6 times as much as the second highest state. They produced in 2016 18,296 MW for 4,732,000 households. The second place is North Carolina who produced 3,016 MW for 341,00 households. You can see the big difference in the states, California is way a head on the solar energy.

When we speak of the biomass industry, from about 1990 to 1993 California's biomass power generation was at its highest (more than 800 MW of installed capacity). In 1996, the energy production from biomass dwindled to about 590 MW. The expiration of the price support to the biomass industry from the government is the main reason for the reduction in biomass power generation in California. Currently, there are about 30 direct-combustion biomass facilities in operation with a capacity of 640 MW. This is less than half of the facilities in operation during the industry's peak.

Sources:

<http://www.seia.org/research-resources/top-10-solar-states>

<http://www.energydigital.com/top10/3498/Top-10:-US-States-with-Installed-Wind-Capacity>

<http://www.energy.ca.gov/biomass/biomass.html>

## Possibility to build

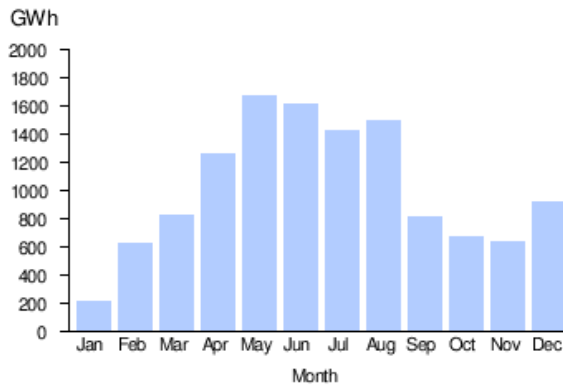
For all three renewable energy sources the government encourages them to produce this. California wants to be the number one state in the United States in renewable energy so I think that there's a lot of possibility to build. Even though Trump doesn't believe in the green house effect California makes its own rules to keep on grinding on the green energy.

Sources:

[https://en.wikipedia.org/wiki/Wind\\_power\\_in\\_California](https://en.wikipedia.org/wiki/Wind_power_in_California)

## Possibility to turn

As you can see in the picture next to this the wind generation of California is really high since it's a state that's lying next to the coast. They are now working on a new possibility to build an offshore windmill powerplant.



Sources: [https://en.wikipedia.org/wiki/Wind\\_power\\_in\\_California](https://en.wikipedia.org/wiki/Wind_power_in_California)

### Possibility to transport and access to water

While the nation’s infrastructure earned a “D+” in the 2017 Infrastructure Report Card, California faces infrastructure challenges of its own. For example, driving on roads in need of repair in California costs each driver \$844 per year, and 5.5% of bridges are rated structurally deficient. Drinking water needs in California are an estimated \$44.5 billion, and wastewater needs total \$26.2 billion. 678 dams are considered to be high-hazard potential. The state’s schools have an estimated capital expenditure gap of \$3.2 billion. This deteriorating infrastructure impedes California’s ability to compete in an increasingly global marketplace. Success in a 21st century economy requires serious, sustained leadership on infrastructure investment at all levels of government. Delaying these investments only escalates the cost and risks of an aging infrastructure system, an option that the country, California, and families can no longer afford.

Source: <http://www.infrastructurereportcard.org/state-item/california/>

Technological			
Windmills	Innovation		3
	Possibility to build		Go
	Possibility to turn		2
Solar panels	Innovation		3
	Possibility to build		GO
	Possibility to turn		3
Biomass	Innovation		2
	Possibility to build		Go
	Possibility to transport		2
	Access to water		3

# Ecologist

## Windspeed

California has a wind speed average of 7 mph, with some peak areas at the eastern part of the state (reaching 24 mph) and at the northern area. However, speed needed to wind turbines to work oscillates between 25 mph to 35 mph, higher than the wind speed of the area.

Source:

<http://www.usairnet.com/weather/maps/current/california/wind-speed/>

## Hours of sun:

California is a sunny state. Its location in the south-western part of the country makes it have almost a 70% of sun percentage (time between sunrise and sunset). It has a total of 3055 hours and 168 days of clear wether.

Sources:

<https://www.currentresults.com/Weather/US/average-annual-state-sunshine.php>

## Quantity of biomass

There is a large amount of biomass in California. The principal components of biomass are: agricultural residues, forest materials, and municipal waste. In addition, it is possible to grow crops to be used specifically as feedstock for energy or for the development of products derived from biomaterials. These crops are referred to as dedicated crops. Nearly 90 million tons of biomass are produced annually in California, but only 30 to 40 million tons are estimated to be technically feasible to collect and use in producing renewable electricity, fuels, and biomass-based products. About 30 percent of this amount could come from agriculture, 40 percent from forestry, and another 30 percent could be recovered from municipal sources, including landfill gas and biogas (methane) from wastewater treatment.

Source:

<https://www.library.ca.gov/crb/05/10/05-010.pdf>

Ecologisch				
	Windmills	CO2 Revenu	Windspeed	2
	Solar panels	CO2 Revenu	Times of Sun	3
	Biomass	CO2 Revenu	quantity of biomass	1

# Political

## Legislation

California, with its abundant natural resources, has a long history of support for renewable energy.

In 2009, 11.6 percent of all electricity came from renewable resources such as wind, solar, geothermal, biomass and small hydroelectric facilities. Large hydro plants generated another 9.2 percent of our electricity.

Around the turn of the 20th century, tens-of-thousands of homes in Southern California took advantage of the "California sunshine" to heat water for their homes. The oil crises of the 1970s gave rise to concerns over dependence on fossil fuels. At that time, federal and state tax credits helped establish a new solar and wind industry. Wind turbine farms cropped up on the slopes of hills in three primary locations.

Following deregulation of the electric utilities in 1998, the California Energy Commission was placed in charge of a new **Renewable Energy Program** to help increase total renewable electricity production statewide. This followed decades of bipartisan legislative and gubernatorial support for renewable energy, helping to make California a recognized leader in the field.

Source:

<http://www.energy.ca.gov/renewables/>

## Influence government

The California government is fully supporting all the renewable energy sources. It wants to be the number one state of the United States when it comes to renewable sustainable energy.



Political	Windmills	Legislation	2
		Influence government	3
		War	Go
	Solar panels	Legislation	3
		Influence government	3
		War	Go
	Biomass	Legislation	2
		Influence government	1
		War	Go

### 3.3. Washington State economic

Economic					
	Windmills	Costs of building	10	2	20
		Costs of Maintenance	8	1	8
		Revenues	10	2	20
		Economical situation	Go/ No Go	✓	0
	Solar panels	Costs of building	10	1	10
		Costs of Maintenance	8	1	8
		Revenues	10	2	20
		Economical situation	Go/ No Go	✓	0
	Biomass	Costs of building	10	2	20
		Costs of Maintenance	8	2	16
		Revenues	10	1	10
		Economical situation	Go/ No Go	✓	0
Average Economic				✓	12

#### Windmills

##### Cost of building

The cost of building windmills has to do with many factors. The build of a commercial wind turbine range from about 1.3 million to 2.2 million per MW of nameplate capacity installed. Nowadays the average wind turbine is installed at 2 MW

Sources:

[http://www.windustry.org/how\\_much\\_do\\_wind\\_turbines\\_cost](http://www.windustry.org/how_much_do_wind_turbines_cost)

##### Cost of maintenance

The average cost of maintenance are on average around 3% of the original cost of the turbine. This is an international taken average.

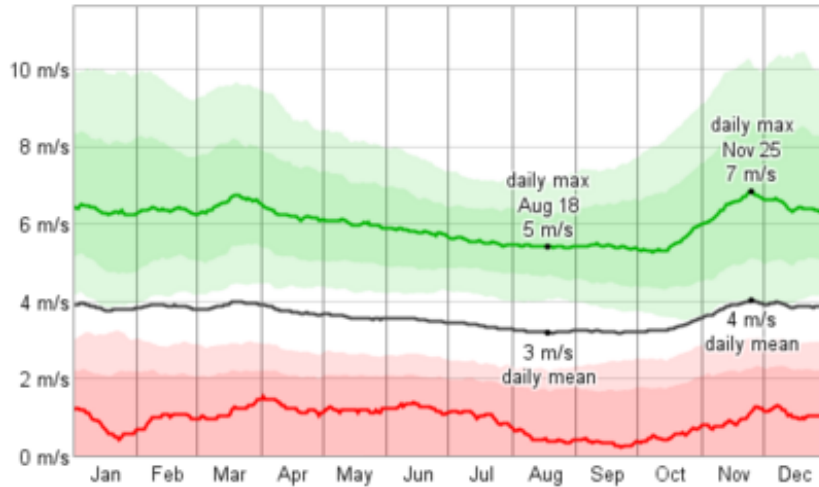
Sources:

<http://www.windmeasurementinternational.com/wind-turbines/om-turbines.php>

##### Revenues

The revenues of a windmill farm ofcourse depends on how much the wind blows. As shown in the picture below the wind blows almost all the time so it is a very good spot for wind energy. And we can expect a good revenue in the end.

## Wind Speed



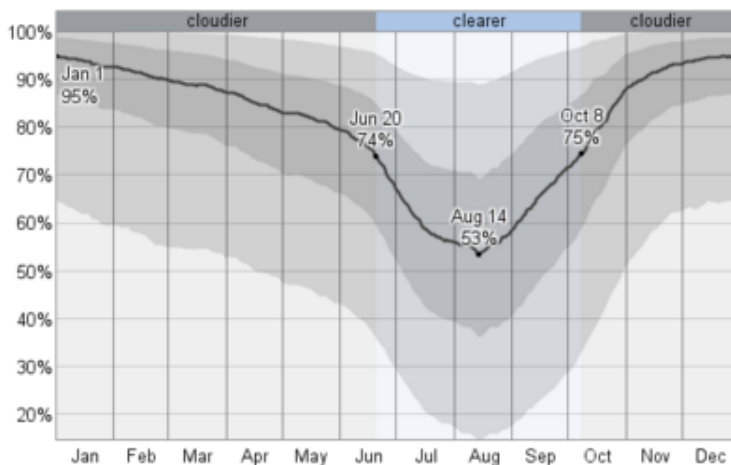
The average daily minimum (red), maximum (green), and average (black) wind speed with percentile bands (inner band from 25th to 75th percentile, outer band from 10th to 90th percentile).

Sources: <https://weatherspark.com/averages/31576/Seattle-Washington-United-States>

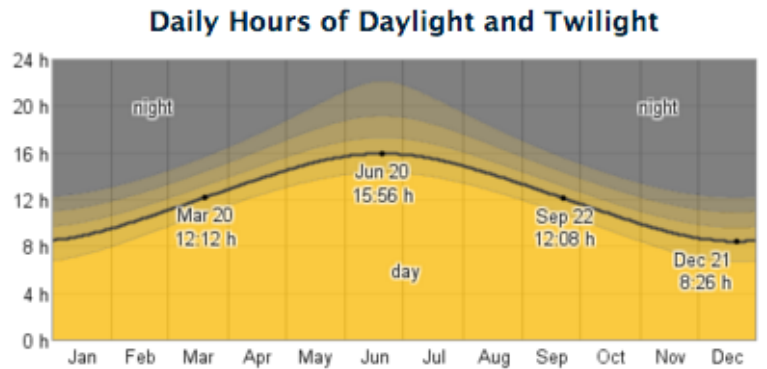
## Solar panels

The most important factor before installing solar panels are the hours of sun each day and the cloud coverage. As shown in the pictures below is the average cloud coverage very high and that very negative for the solar panels.

## Median Cloud Cover



The median daily cloud cover (black line) with percentile bands (inner band from 40th to 60th percentile, outer band from 25th to 75th percentile).



*The number of hours during which the Sun is visible (black line), with various degrees of daylight, twilight, and night, indicated by the color bands. From bottom (most yellow) to top (most gray): full daylight, solar twilight (Sun is visible but less than 6° from the horizon), civil twilight (Sun is not visible but is less than 6° below the horizon), nautical twilight (Sun is between 6° and 12° below the horizon), astronomical twilight (Sun is between 12° and 18° below the horizon), and full night.*

Sources: <https://weatherspark.com/averages/31576/Seattle-Washington-United-States>

#### Revenues

The revenues are very low because the cloud coverage is way to high.

## Biomass

#### Cost of building

The building of a biomass stove/generator is not that expensive. The most important factor is that there is enough biomass fuel to generate the power. And there is because Washington state is full of woods.

#### Revenues

The biomass industry is a good growing industry. In the picture below there is a picture stating the expectations in 2040.



## View and noise

All the view and noise complaints are very low, because a few people live near the windmill or solar panel farms. And the ones who live near it choose for it. Washington has a very large ground space where nobody lives so there is space enough for solar panels without damaging the view of the residents or making a lot of noise.

## Technological

Technological					
	Windmills	Innovation	2	3	6
		Possibility to build	Go/No Go	✓	0
		Possibility to turn	50	2	100
	Solar panels	Innovation	2	2	4
		Possibility to build	Go/No Go	0	0
		Possibility to turn	50	2	100
	Biomass	Innovation	2	2	4
		Possibility to build	Go/No Go	0	0
		Possibility to transport	30	3	90
		Access to water	50	3	150
Average Technological				✓	64,8571429

## Innovation

- Windmills. Washington brought its first utility-scale project online in 2001 and has continued developing resources along the Columbia Gorge since that time, currently ranking ninth in the nation for installed wind capacity. Developing the state's wind resource has created economic development for the state. There are at least ten manufacturing facilities in Washington producing components for the wind industry. Entering the wind energy supply chain translates into high quality jobs across the state, such as those created by gearbox manufacturer Gear Works in Seattle.
- Solar panels. A new partnership will bring the innovative AllEarth Solar Tracker solar electric system to homeowners and businesses in Washington State. So the innovations in Washington are very high.
- Biomass. Despite tremendous renewable forest resources, and significant areas being without access to natural gas – the least expensive and lowest emitting of the fossil fuels, Washington State has just one facility at Forks High School and Middle School that uses woody biomass for its heating needs. When sourced locally from forest restoration activities and sawmill operations, biomass can provide big cost savings and independence from fossil fuels. Sustainable Northwest is helping forest communities in Oregon, Idaho, and now Washington find ways to bring biomass online.

## Sources:

- <http://www.sustainablenorthwest.org/blog/posts/biomass-opportunities-in-washington-state>
- <https://www.allearthrenewables.com/news/press-releases/new-local-energy-partnership-brings-innovative-solar-tracker-to-washington-state>
- <http://awea.files.cms-plus.com/FileDownloads/pdfs/washington.pdf>

### Possibility to build

- Windmills. The possibility to build windmills is very big, because there are very large open lands where they can easily be build.
- Solar Energy. The possibility to build the solar energy station is very high. There are a lot of spaces where they can easily build these installations.
- Biomass. The possibility to build the biomass installations are very high. There are a lot of recourses available and a lot of space to build the installations.

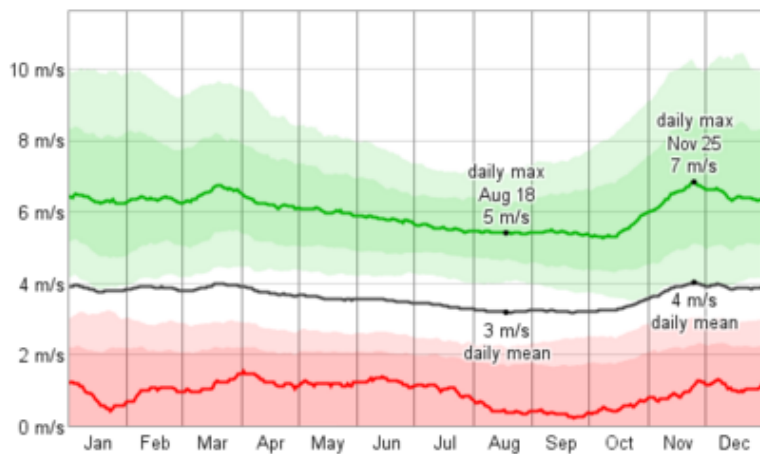
### Ecological

Ecologisch						
	Windmills	CO2 Revenu	Windspeed	15	2	30
	Solar panels	CO2 Revenu	Times of Sun	15	1	15
	Biomass	CO2 Revenu	quantity of biomass	10	3	30

### Wind speed

- The wind speed is fairly high. And therefore in south Washington there are a lot wind mill parks. The picture below shows the wind speed averages.

#### Wind Speed

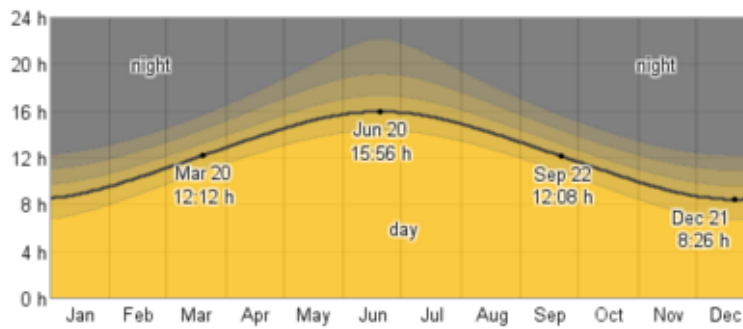


*The average daily minimum (red), maximum (green), and average (black) wind speed with percentile bands (inner band from 25th to 75th percentile, outer band from 10th to 90th percentile).*

### Hours of sun

- The hours of sun are fairly normal. But there are a lot of clouds which blocks the sun from coming through so the sun hours don't count that much. The picture below shows the hours of sun in Washington.

### Daily Hours of Daylight and Twilight



The number of hours during which the Sun is visible (black line), with various degrees of daylight, twilight, and night, indicated by the color bands. From bottom (most yellow) to top (most gray): full daylight, solar twilight (Sun is visible but less than 6° from the horizon), civil twilight (Sun is not visible but is less than 6° below the horizon), nautical twilight (Sun is between 6° and 12° below the horizon), astronomical twilight (Sun is between 12° and 18° below the horizon), and full night.

#### Quantity of biomass

- There is a lot of biomass available in Washington. Because the half of Washington is covered in forest. The picture below shows the amount of acres of land is forest land, and what the percentage of total it is.

### Washington Forestland Ownership

Washington's total land area is 42.5 million acres. Half of this is forested. Nearly 36% of the forestland is privately owned, and 64% is managed by the government.

	Acres (000)	Acres (000)	Percent of Total
<b>Washington Total Land Area</b>		<b>42,515</b>	<b>100%</b>
Forestland		22,119	52%
Other Land (urban, cropland, etc.)		20,396	48%

Sources:

<http://www.wfpa.org/forest-policy/washington-forests/>

<https://weatherspark.com/averages/31576/Seattle-Washington-United-States>



## Political

Political	Windmills	Legislation	20	3	60
		Influence government	4	3	12
		War	Go/No Go	0	0
	Solar panels	Legislation	20	3	60
		Influence government	4	3	12
		War	Go/No Go	0	0
	Biomass	Legislation	20	3	60
		Influence government	4	3	12
		War	Go/No Go	0	0
<b>Average Political</b>					<b>32,333333</b>

The Washington Renewable Energy Cost Recovery Incentive Payment Program was created by the Washington Legislature to encourage the development of renewable energy projects in the state.

Through this program customers receive payments for energy generated from renewable generating systems. Participating customers receive annual payments based on the number of kilowatt-hours produced by the renewable energy facility times the applicable rate.

The rate a customer receives varies by the type of technology used in the generation facility and the state where the facility's equipment was manufactured. Certification to participate in the program is granted by the Washington Department of Revenue.

Source:

[https://www.pacificpower.net/env/nmcg/washington\\_renewableenergyprogram.html](https://www.pacificpower.net/env/nmcg/washington_renewableenergyprogram.html)

### 3.4. Oregon

Economic				
	Windmills	Costs of building	10	2
		Costs of Maintenance	8	2
		Revenues	10	3
		Economical situation	Go/ No Go	Go
	Solar panels	Costs of building	10	2
		Costs of Maintenance	8	2
		Revenues	10	2
		Economical situation	Go/ No Go	Go
	Biomass	Costs of building	10	2
		Costs of Maintenance	8	2
		Revenues	10	2
		Economical situation	Go/ No Go	Go

- **Economic**

#### **Costs of building**

The annual mean wage of construction labourers in Oregon State oscillates between \$34,250 to \$41,330, being higher than the country average, but lower than in many other states. This could mean an increase in building cost.

Sources: <https://www.bls.gov/oes/current/oes472061.htm>

#### **Cost of maintenance**

There should not be any maintenance cost difference between costs of maintenance in different states. The only main difference could exist in the difference average wages of maintenance workers. Oregon State maintenance workers' wages oscillate between \$34,840 to \$42,260, being relatively high.

Sources: <https://www.bls.gov/Oes/current/oes499071.htm>

#### **Revenues**

- Windmills. Oregon is a pointer state in wind energy, so we can expect high revenues by expanding to this market.
- Solar panels. Oregon is the 12<sup>TH</sup> U.S.A. state in solar power capacity revenues, but its actual capacity is incredibly low compared with the heads of the list. Nevertheless, the state policies (as is explained in the political criteria paragraph) are encouraging this kind of renewable energy. For this reason, this market should grow in the next future, transforming it in a good invest option.
- Biomass. This renewable energy is gaining importance after new state political decisions, and, as same as solar energy, could be an interesting investing option.

Sources:

<http://www.awea.org/resources/statefactsheets.aspx>

<https://cleantechnica.com/2013/06/25/solar-power-by-state-solar-rankings-by-state/>

#### **Economical situation**

Oregon is the 10<sup>TH</sup> strongest economical state of the U.S.A., the greatest world economy. This data show a great economical situation.

Sources:

<http://www.businessinsider.com/state-economy-ranking-july-2015-2015-7?international=true&r=US&IR=T/#51-mississippi-1>

- **Social**

Social					
	Windmills	Local residents	View	2	2
			Noise	2	1
	Solar panels	Local residents	View	2	3
			Noise	2	3
	Biomass	Local residents	View	2	3
			Noise	2	3

**View**

- Windmills. Across the areas where huge wind farms are placed, some neighbours complain about the viewing and landscape damage they produce to the area. Nevertheless, it is not an important problem.
- Solar panels. Oregon has any complain about solar panel view.
- Biomass. Oregon has any complain about biomass view.

Sources:

[http://www.oregonlive.com/news/index.ssf/2009/03/oregon\\_wind\\_farms\\_whip\\_up\\_nois.html](http://www.oregonlive.com/news/index.ssf/2009/03/oregon_wind_farms_whip_up_nois.html)

**Noise**

- Windmills. This is the main problem for inhabitants living close to wind farms, and has led to judicial issues between neighbours and windmill companies.
- Solar panels. This source of energy is completely quiet, because it does not contain mobile parts, so no complain against solar panel noise could be made.
- Biomass. Oregon has any complain about biomass plants noises.

Sources

[http://www.oregonlive.com/news/index.ssf/2009/03/oregon\\_wind\\_farms\\_whip\\_up\\_nois.html](http://www.oregonlive.com/news/index.ssf/2009/03/oregon_wind_farms_whip_up_nois.html)

[http://www.oregonlive.com/pacific-northwest-news/index.ssf/2013/08/post\\_133.html](http://www.oregonlive.com/pacific-northwest-news/index.ssf/2013/08/post_133.html)

<http://www.zmescience.com/ecology/renewable-energy-ecology/solar-panels-pros-and-cons-056654/>

- **Technological**

Technological				
	Windmills	Innovation	2	2
		Possibility to build	Go/No Go	Go
		Possibility to turn	50	2
	Solar panels	Innovation	2	3
		Possibility to build	Go/No Go	Go
		Possibility to turn	50	3
	Biomass	Innovation	2	3
		Possibility to build	Go/No Go	Go
		Possibility to transport	30	2
		Access to water	50	3

**Innovation:**

- Windmills. Oregon is the 6<sup>TH</sup> state of the U.S.A. in wind power capacity installations. however, neither government or local companies are not focused on developing this kind of energy in an innovative way.
- Solar Panels. One of the main points of Oregon solar panels innovation is the local company Solo Power, who makes flexible and reliable ultra-lightweight solar panels on a large scale. Also the Oregon-Israel Business Alliance, a program of the Technology Association of Oregon, and Green Empowerment are hosting the company Gigawatt Global (a multinational renewable energy company focused on the development and management of utility-scale solar fields in emerging markets) for a short presentation on his work with utility-scale solar projects.
- Biomass. Oregon State is focusing on biomass industry. Working together with the US Department of Agriculture National Institute of Food and Agriculture (USDA NIFA), and Washington State University, it is developing a new project focused on developing a biofuels industry in the northwest (emphasizing in biomass use).

Sources:

<http://www.oregon.gov/energy/At-Work/Pages/Renewable-Energy-Grants.aspx>

<https://portlandgreenenergy.wordpress.com/wind-farms-in-oregon/>

<http://www.altenergymag.com/article/2016/05/the-50-most-innovative-new-renewable-energy-companies/23565/>

<http://owic.oregonstate.edu/biomass-projects>

**Possibility to built**

- Windmills. Oregon's windmill industry is developing thanks to government encourage of renewable energy. Moreover, world's largest wind farm is planned to be built in this state. For this reasons, we can affirm there are huge possibilities to built.

- Solar energy. As mentioned before and explained at political section, renewable energy is being encourage by Oregon's government. Also the territory is available for this kind of installations.
- Biomass. As same as both energies mentioned before.

Sources:

<http://www.seia.org/state-solar-policy/oregon>

<http://www.oregon.gov/energy/At-Work/Pages/Renewable-Energy-Grants.aspx>

**Possibility to turn:**

- Windmill. At the coastal area of Oregon, wind blows mainly in the same direction, making les necessary to turn the windmills, and around the whole state, the wind mainly blows in northern direction. Nevertheless, in the northern area of the state, wind blows in different direction, without follow a pattern.
- Solar Panels. New develops in solar panels construction and the presence of one of the most innovative solar companies in the area (Solo Power) make solar panels totally available to turn in search of sunlight.

Sources:

<http://www.usairnet.com/weather/maps/current/oregon/wind-direction/>

<http://www.altenergymag.com/article/2016/05/the-50-most-innovative-new-renewable-energy-companies/23565/>

**Possibility to transport:**

Oregon roads are well prepared and connect almost all the state, however, forestall area roads suffer several problems. The main problem is snow, that led to road cuts and transport problems in so mo areas of Oregon (in the inner part of the state, where most forestall area is placed). Also waste and grave can be a problem in forestall roads, slowing transportation and making it more dangerous.

Sources:

<http://www.oregon.gov/ODF/Recreation/Pages/RoadClosure.aspx>

<https://www.currentresults.com/Weather/Oregon/annual-snowfall.php>

**Access to water:**

Oregon is a coastal state, which means sea water use for refrigeration is available. Also the whole state (except mainly some extensions in the central area) are wide covered

by rivers, most of them also available for our goals.

Sources

[https://www.oregon.gov/owrd/SW/docs/SW02\\_002.pdf](https://www.oregon.gov/owrd/SW/docs/SW02_002.pdf)

- **Ecologist**

Ecologist					
	Windmills	CO2 Revenue	Wind speed	15	1
	Solar panels	CO2 Revenue	Hours of Sun	15	1
	Biomass	CO2 Revenue	Quantity of biomass	10	3

**Wind speed:**

Oregon has a wind speed average of 9 mph, with some peak areas at the northern part of the state (reaching 20 mph) and at the eastern area. However, speed needed to wind turbines to work oscillates between 25 mph to 35 mph, higher than the wind speed of the area.

Sources:

<http://www.usairnet.com/weather/maps/current/oregon/wind-speed/>

<https://www.wind-watch.org/faq-technology.php>

**Hours of sun:**

Oregon is not a sunny state. Its location in the northern part of the country make it have less than a 50% of sun percentage (time between sunrise and sunset). Also, the amount of sunny hours is one of the lowest of the country.

Sources:

<https://www.currentresults.com/Weather/US/average-annual-state-sunshine.php>

**Quantity of biomass:**

Oregon State many ways to obtain biomass, being the main ones: wood (close to 40% of the state is covered by forests), municipal solid waste, biogas and agricultural sources. For this reason, the required biomass flow is assured.

Sources:

<https://www.oregon.gov/ODF/Documents/AboutODF/ForestryFactsFigures.pdf>

<http://www.deq.state.or.us/aq/committees/docs/apr2010/finalBiomass.pdf>

**Political:**

Political	Windmills	Legislation	20	2
		Influence government	4	2
		War	Go/No Go	Go
	Solar panels	Legislation	20	3
		Influence government	4	3
		War	Go/No Go	Go
	Biomass	Legislation	20	3
		Influence government	4	3
		War	Go/No Go	Go

**Legislation:**

Oregon legislature has set new renewable energy standards, which main goal to archive is increasing the amount of qualifying renewable energy deliver to customers

till 50 percent of the total energy consumed by 2040. It also sets a timetable for eliminate coal-fired electric power in the state.

This program is based in 2 mayor renewable energies: biomass and solar energy.

- The bill lifts the existing ban on using RECs (Renewable Energy Certificate) generated by biomass and municipal solid waste facilities.
- The bill establishes a community solar program for Oregon, allowing residential and small commercial customers to credit electricity received from off-site solar projects to their utility bills.

Sources:

<https://www.portlandgeneral.com/our-company/news-room/news-releases/2016/03-02-2016-oregon-legislature-sets-new-renewable-energy-standards>

<http://www.renewableenergyworld.com/articles/2016/03/oregon-legislature-passes-50-percent-renewable-portfolio-standard.html>

**Influence Government:**

Democratic Party governs Oregon state. This party, unlike the Republican Party, is wide concerned about climate change and the encourage of renewable energy. It also support the use of clean energy at public buildings, emphasizing biomass and solar power use. For this reasons we can asset Oregon's government benefits our development.

Sources:

<http://www.oregon.gov/ENERGY/pages/index.aspx>

## 4. Intern analyse

Below you can read the intern analyze for HSE International. First you can read a description over the current strategy, organization structure and company culture. These subjects will be worked out on basis of the 7s model of McKinsey<sup>2</sup>. This model is a management model that can be used to describe an intern analyze. It can also be used to describe a future strategy or to develop a new strategy.

### **The structure of HSE International<sup>3</sup>**

Hanze Sustainable Energy International is a Dutch manufacturer and project developer of sustainable energy technology. The company can be put down as a small player in the sustainable energy market. The company is one of the companies within the energy Valley region and has been marked as an outstanding entrepreneur in the new energy sector.

HSE International stated as a wind turbine blade manufacturer, in the beginning of the 80s the construction of wind turbines was added. From that time on the company has stopped being a subsidiary and has sold almost exclusively entire wind turbines.

In the beginning of the century the company started a biomass fermenter manufacturer and a manufacture of solar thermal installations. These projects have been made possible by a partnership with Hanze Sustainable Invest (HSI). The company currently consists of five divisions: Wind, Biomass, Solar Thermal, Construction and Projects. Projects has been a backup in case demand in the market decreases. The management has decided that the company can enlarge his size. The stable position in the European market will be surpassed by a step into a market outside of Europe.

### **Strategy of HSE International**

The company wants that the outcome of the process has to be a generally accepted expansion strategy, which means that compromises will be inevitable during the process.

### **Systems of HSE International**

The government has issued several generally accepted guidelines, which we are obliged to meet. The communication of the management team will be done through drop box.

### **Style of HSE International**

The management of HSE International asked us to work within a research team. The research team consists of 4 to 5 people. In our case there are 5 people. It will be our own responsibility to safeguard the specific criteria drafted by the department we

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<sup>2</sup> 7S Model of McKinsey

<sup>3</sup> Case HSE International §4 Company description



have been asked to represent. The research team will be asked to inform the management of our progress by discussing our finding within our group in a project meeting. At the end we will be giving a poster presentation to an expert group to present our findings.

### **Staff of HSE International**

The staff members have different departments where each member is responsible for, the departments are: Wind, Biomass, Solar thermal, Construction and Project. Each member is asked to be very flexible so they can help the other members of the research team.

### **Skills of HSE International**

The HSE International is ranked as a small player in the sustainable energy market. However, the company has a stable and strong basis in the European market. The company is one of the companies within the Energy Valley region and has been marked as an outstanding entrepreneur in the energy sector. On request, the company has also been part of advisory councils for European legislators on renewable energy. Because they were so successful in Europe they decided to expand outside of Europe. The management decided to include all divisions and form an interdivisional research group with representatives of all divisions.

## 5. SWOT Analysis

### 5.1. Strengths

#### Strengths

- **Company's reputation**
- **Technological features**
- **Biomass develop**

#### **Company's reputation**

The company is one of the companies within the Energy Valley region and has been marked as an outstanding entrepreneur in the new energy sector. On request, the company has also been part of advisory councils for European legislators on renewable energy.

#### **Technological features**

For example HSE Solar only focuses on concentrated solar thermal plants, especially high temperature plants. HSE Solar is using both parabolic trough and solar tower technology for their plants. So it is very good possible that we can build solar thermal plants in very hot places. For example Florida. The market size for the solar plants is very big. Because it is very good and profitable to do solar energy in Florida.

#### **Biomass develop**

Also by acquiring a biomass digesting plant manufacturer at the begin of the century HSE Biomass now holds a significant knowledge on the biomass subfield of digestion plants. HSE biomass especially focuses on the production of green gas out of agricultural rest products. So it is also very likely that HSE can invest in biomass for example in Washington.

### 5.2. Weakness

#### Weakness

- **High starting cost**
- **Lack of knowledge of foreign markets**
- **Internal issues between departments**
- **Renewable energy disrepute**

### **High starting costs.**

International expansion cost are incredibly high. Moreover, we should take into account that renewable energy market is a developing market, relatively uncertain. For this reasons, expansion should be carefully studied and calculated.

### **Lack of knowledge of foreign markets**

Foreign markets could be studied in terms of technology, political and legal issues, economy... Nevertheless, HSE International is an European company, with lack of experience abroad the European Union, so socio-cultural features of countries where it could expand would be needed to learn. This features can only be assimilated by experience, that could lead to problems at the first stages of the expansion.

### **Internal issues between departments**

Each of five departments that form HSE International (solar thermal, biomass, wind, projects and construction) should be agree on the expansion, having each one of them the right of veto. The company should deal with internal differences in order to decide where and how the expansion is going to take place.

### **Renewable energy disrepute**

Nowadays, renewable energy have a great amount of opponents in our society. People against climate change theory, or inhabitants of traditional fossil fuel producer areas are some of them. In order to start the expansion, HSE International should take into account this features, that can affect to their image but also to their acceptance.

## 5.3. Opportunity

### **Opportunities**

- **Entering a new district, may lead to a higher sale.**
- **Divide opportunities and threats**
- **Fast growth of the new coming market.**
- **Grow in 'green energy'**

### **Entering a new district, may lead to a higher sale.**

By entering a new district, there will be more possible customers. The company will enter a whole new area with much more possibilities to sell the products.

### **Divide opportunities and threats**

At this moment Hanze Sustainable Energy International is a Dutch manufacturer and project developer of sustainable energy technology. The company can be ranked as a

small player in the sustainable energy technology. The company has a stable and strong basis in the European market. By entering a new market there will opportunities to grow and divide the threats. As the current market will go worse the new market will have opportunities.

#### **Fast growth of the new coming market.**

Entering a new market will be better for a growth of the current market. The reason for this is that the companies will be a famous company that is known over different places.

#### **Grow in 'green energy'**

The 'green energy' sector is a sector that is hardly growing. In the 20th century a lot of firms are using green energy sources. The producing and manufacturing by Corporate Social Responsibility is also important for a lots of customers.

### 5.4. Threats

Threats
<ul style="list-style-type: none"><li>➤ <b>Subsidy cost per unit decrease</b></li><li>➤ <b>Political changes</b></li><li>➤ <b>Market with increasing competition</b></li></ul>

#### **Subsidy cost per unit decrease.**

As renewable energies are no longer a new form of energy generation and are occupying a place in the energy market, some of the subsidies and aids given to them to encourage its develop, are decreasing or even disappearing in some countries. This situation decreases its short term profitability.

#### **Political changes.**

Some political changes to conservative politics in developed countries could directly affect renewable energy develop. Conservative government are traditionally less concerned about climate change, and tend to favor traditional sources of energy as fossil fuels or coal. This could be easily checked for example in the U.S.A. with Donald Trump's new politics.

#### **Market with increasing competition.**

Renewable energy has proved its success and profitability during the last years. This has made renewable energy a market where invest, and the number of this kind of

companies has increased significantly. The result of this events is a high invest market, but with an increasing competition.

## 6. Conclusion

The company has many strengths who helps them to get to the point where they want to be. They have an enormous reputation within the Energy Valley region, an outstanding entrepreneur. HSE Solar division only focuses on (high temp) solar thermal plants, they are working on the technological features all the time. Which makes it possible to build solar plants in places where the market size is very big. Besides that, the developments in biomass does the right thing for HSE Biomass, because they focus solely on production of green gas it's a very good opportunity to invest in. One of the major problems of getting international is that the starting costs are very high. When we enter a foreign market a company has barely any knowledge and first must start gathering information and that will take a long time to start up. Besides that, all the divisions of the HSE should agree on the international expansion. Now that could be very hard since not every division can get the best in the same country, some have sacrifice for the sake of the others. While entering a new foreign market can be very risky it can also pay off of course. While you enter a new district, you increase the change of getting a higher sale percentage. Also, when you have a lot of opportunities and threats having multiple divisions in multiple countries it means that you have the change of spreading your threats and opportunities. While we have a lot of good things going on there are always some threats around the corner. Because green energy is getting much more popular and more companies are investing in this market segment. Which means that the government will decrease the subsidies and the competition will increase. Besides that, the politics have changed since the US has a new president, Trump doesn't believe in climate change so we get a lot less support from the politics.



- <http://www.businessinsider.com/state-economy-ranking-july-2015-2015-7?international=true&r=US&IR=T/#51-mississippi-1>
- [http://www.oregonlive.com/news/index.ssf/2009/03/oregon\\_wind\\_farms\\_whip\\_up\\_nois.html](http://www.oregonlive.com/news/index.ssf/2009/03/oregon_wind_farms_whip_up_nois.html)
- [http://www.oregonlive.com/news/index.ssf/2009/03/oregon\\_wind\\_farms\\_whip\\_up\\_nois.html](http://www.oregonlive.com/news/index.ssf/2009/03/oregon_wind_farms_whip_up_nois.html)
- [http://www.oregonlive.com/pacific-northwest-news/index.ssf/2013/08/post\\_133.html](http://www.oregonlive.com/pacific-northwest-news/index.ssf/2013/08/post_133.html)
- <http://www.zmescience.com/ecology/renewable-energy-ecology/solar-panels-pros-and-cons-056654/>
- <http://www.oregon.gov/energy/At-Work/Pages/Renewable-Energy-Grants.aspx>
- <https://portlandgreenenergy.wordpress.com/wind-farms-in-oregon/>
- <http://owic.oregonstate.edu/biomass-projects>
- <http://www.seia.org/state-solar-policy/oregon>
- <http://www.oregon.gov/energy/At-Work/Pages/Renewable-Energy-Grants.aspx>
- <http://www.usairnet.com/weather/maps/current/oregon/wind-direction/>
- <http://www.altenergymag.com/article/2016/05/the-50-most-innovative-new-renewable-energy-companies/23565/>
- <http://www.oregon.gov/ODF/Recreation/Pages/RoadClosure.aspx>
- <https://www.currentresults.com/Weather/Oregon/annual-snowfall.php>
- [https://www.oregon.gov/owrd/SW/docs/SW02\\_002.pdf](https://www.oregon.gov/owrd/SW/docs/SW02_002.pdf)
- <https://www.portlandgeneral.com/our-company/news-room/news-releases/2016/03-02-2016-oregon-legislature-sets-new-renewable-energy-standards>
- <http://www.renewableenergyworld.com/articles/2016/03/oregon-legislature-passes-50-percent-renewable-portfolio-standard.html>
- <http://www.oregon.gov/ENERGY/pages/index.aspx>

We would like to thank our resources for releasing their information to use.



# Apendix A

DESTEP	Source	Criterion 1	Criterion 2	Weight	Alaska	Alaska2	Californ	Californ	Washin	Washin	Oregon	Oregon
<b>Demographic</b>												
	Windmills											
	Solar panels											
	Biomass											
<b>Average Demographic</b>												
<b>Economic</b>												
	Windmills	Costs of building		10	2	20	1	10	2	20	2	20
		Costs of Maintenance		8	1	8	2	16	1	8	2	16
		Revenues		10	3	30	3	30	2	20	3	30
		Economical situation		Go/No Gd	Go	Go	Go	Go	Go	Go	Go	Go
	Solar pane	Costs of building		10	1	10	3	30	1	10	2	20
		Costs of Maintenance		8	1	8	3	24	1	8	2	16
		Revenues		10	0	0	3	30	2	20	2	20
		Economical situation		Go/No Gd	Go	Go	Go	Go	Go	Go	Go	Go
	Biomass	Costs of building		10	3	30	2	20	2	20	2	20
		Costs of Maintenance		8	3	24	2	16	2	16	2	16
		Revenues		10	2	20	2	20	1	10	2	20
		Economical situation		Go/No Gd	Go	Go	Go	Go	Go	Go	Go	Go
<b>Average Economic</b>						16,66667		21,77778		14,66667		19,77778
<b>Social</b>												
	Windmills	Local residents	View	2	2	4	2	4	3	6	2	4
			Noise	2	2	4	2	4	3	6	1	2
	Solar pane	Local residents	View	2	3	6	2	4	3	6	3	6
			Noise	2	3	6	2	4	3	6	3	6
	Biomass	Local residents	View	2	3	6	2	4	2	4	3	6
			Noise	2	3	6	2	4	2	4	3	6
<b>Average social</b>						5,3333333		4		5,3333333		5
<b>Technological</b>												
	Windmills	Innovation		2	2	4	3	6	3	6	2	4
		Possibility to build		Go/No Gd	Go	Go	Go	Go	Go	Go	Go	Go
		Possibility to turn		50	2	100	2	100	2	100	2	100
	Solar pane	Innovation		2	3	6	3	6	2	4	3	6
		Possibility to build		Go/No Gd	Go	Go	Go	Go	Go	Go	Go	Go
		Possibility to turn		50	3	150	3	150	2	100	3	150
	Biosmass	Innovation		2	3	6	2	4	2	4	3	6
		Possibility to build		Go/No Gd	Go	Go	Go	Go	Go	Go	Go	Go
		Possibility to transport		30	2	60	2	60	3	90	2	60
		Access to water		50	3	150	3	150	3	150	3	150
<b>Average Technological</b>						68		68		64,85714		68
<b>Ecologisch</b>												
	Windmills	CO2 Revenu	Windspeed	15	1	15	2	30	2	30	1	15
	Solar pane	CO2 Revenu	Times of Sun	15	1	15	3	45	1	15	1	15
	Biomass	CO2 Revenu	quantity of biomas	10	3	30	1	10	3	30	3	30
<b>Average Ecological</b>						20		28,3333333		25		20
<b>Political</b>												
	Windmills	Legislation		20	2	40	2	40	3	60	2	40
		Influence government		4	2	8	3	12	3	12	2	8
		War		Go/No Gd	Go	Go	Go	Go	Go	Go	Go	Go
	Solar pane	Legislation		20	3	60	3	60	3	60	3	60
		Influence government		4	3	12	3	12	3	12	3	12
		War		Go/No Gd	Go	Go	Go	Go	Go	Go	Go	Go
	Biomass	Legislation		20	3	60	2	40	3	60	3	60
		Influence government		4	3	12	1	4	3	12	3	12
		War		Go/No Gd	Go	Go	Go	Go	Go	Go	Go	Go
<b>Average Political</b>						25,2		28,1111111		32,3333333		28
Quantity No Go						0		0		0		0
<b>Totale Average</b>						115,2		121,889		117,19		120,778
<b>Total</b>						115,2		121,889		117,19		120,778

Description
0 = Not
1 = Little
2 = OK
3 = Good

# NAMIBIA

## THERMAL SOLAR IN NAMIBIA

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14-6-2017

HSE | HANZE HOGESCHOOL GRONINGEN

## EXECUTIVE SUMMARY

There has been a lot of research in the report that will support the recommendations we will make. Because we have concluded that it's best to invest in Solar Thermal Energy production in Namibia and after transport to South Africa. The recommendation is to build the fabric in Namibia because of the infrastructure, import and export taxes and so on to build there instead of South Africa. We have chosen for South Africa because they are changing their main energy source coal (92,6%) and want to bring it down to only (29,7%) by the year 2030, the want to replace it by sun and wind energy, this is the main reason.

Because we produce in Namibia the wages are low average (around 493,63€).For that reason there's also a lot of unemployment which makes it easy to find people to work with. Because when we start up the factory we need a lot of flexible workforce since we start small and grow bigger as we go through the years. The first year we plan on getting started, working on connections and affaires. We want to produce at least one big solar plant, the second and third year we will make two, and the fourth and fifth year we will make three.

Because of this slow growing plan, we need to have a starting financing loan around the €7.300.000 euros. This will generate the first five years and after we should be looking at profit making. It also costs a lot of money because we need to build the factory first.

For competition we are save at first, there are not any other solar companies and by the time they are attracted we're already up and running. The government is planning on building his first thermal-solar power plant in Arandis.

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## I. Introduction

This advisory report is written for HSE international. HSE international wants to grow their business outside of Europe. Therefore, they hired an internal research group to investigate what and where the best option is to do their business. So that is why this business plan is written.

The type of business chosen is Solar Thermal Energy in Namibia. In Namibia, there are around 3360 sun hours a year. Also, the export to other countries like South Africa is quite cheap.

There is a good infrastructure and there are very low import taxes, only 4,4%. South Africa has also a higher potential market. In South Africa are living around 53 million people and the use of renewable energy sources is very low.

In summary, the potential for HSE is very high in South Africa, but it is cheaper and safer to produce in Namibia than it is in South Africa so the best solution is to export to South Africa from Namibia.

## II. ANALYSIS OF THE INTERNATIONAL BUSINESS SITUATION

### 2.1 Economic, political and legal analysis of the trading country

The economy of Namibia has profited from a pretty high degree in efficiency and global trade. The overall regulatory environment is well organized and simple. With simplified and low tariffs, Namibia is very open to global trade. Despite the difficult and challenging economic environment, the annual economic growth has an average increase of 5% over the past five years.

The overall economic freedom in Namibia remains constrained by long-standing institutional weaknesses and the absence of political commitment to deeper reforms. Namibia is weak in protecting property rights, and despite some progress, anticorruption measures lack effectiveness. The judicial system enforces contracts inconsistently and is vulnerable to political influence.

When we look at the GDP of Namibia it's one of the most important factors when we look at the health of the economy. If we look at the growth of the GDP in Namibia we can see that it has an average growth of 5% over the past five years.

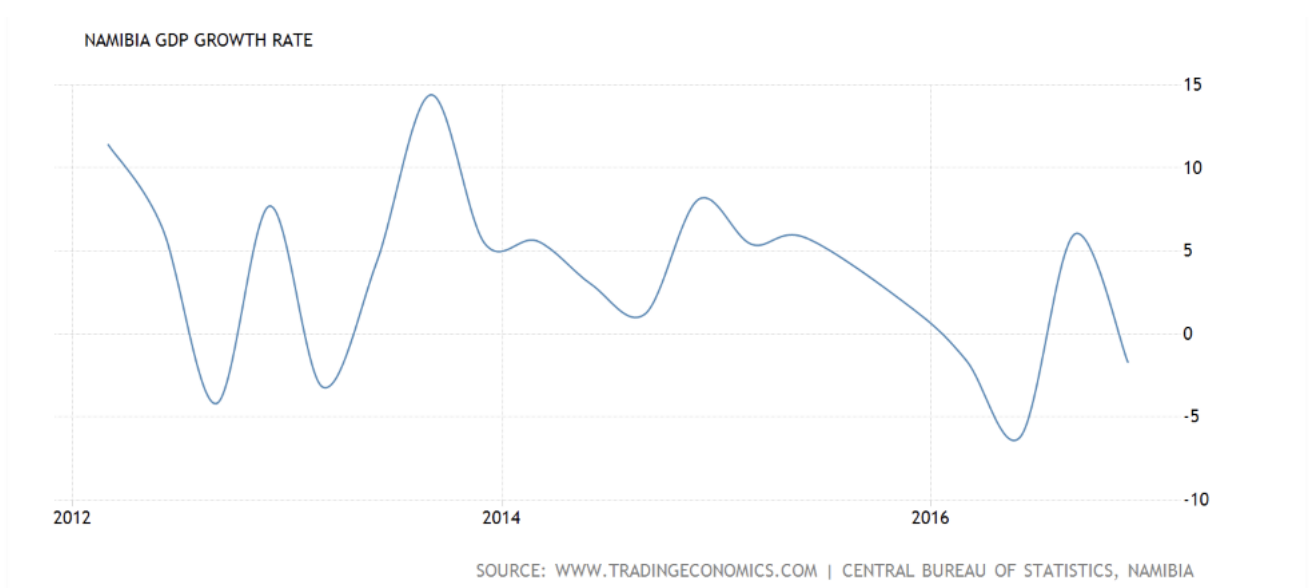


Chart 1: GDP in the past five years

When you combine the growth with the 25,5% unemployment rate in the country we can determine that this makes it a right economy to build a manufacturing business. Due to the unemployment rate, the average costs of salaries are 744,67 \$.

Besides all the above it's also important to know the energy use of the country we are trying to export to. In South-Africa the energy use is around 212.000.000 KW/h a year, which is by

far the biggest in the country. They are planning on growing from coal to a sustainable energy market. They are planning to change from almost no usage sustainable energy to gaining 14,9% Solar and PV, 16,3% Wind power of the total energy use within the year 2030.

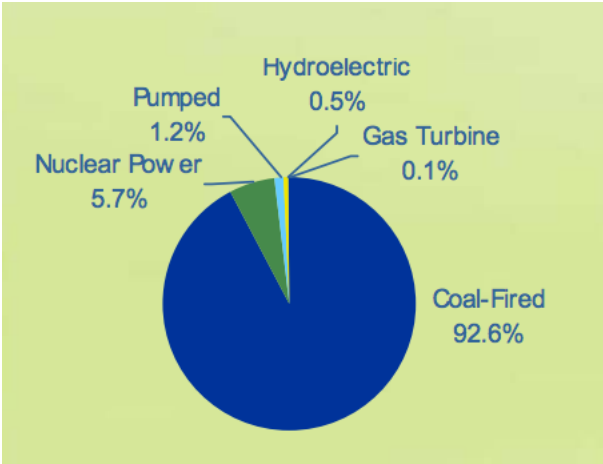
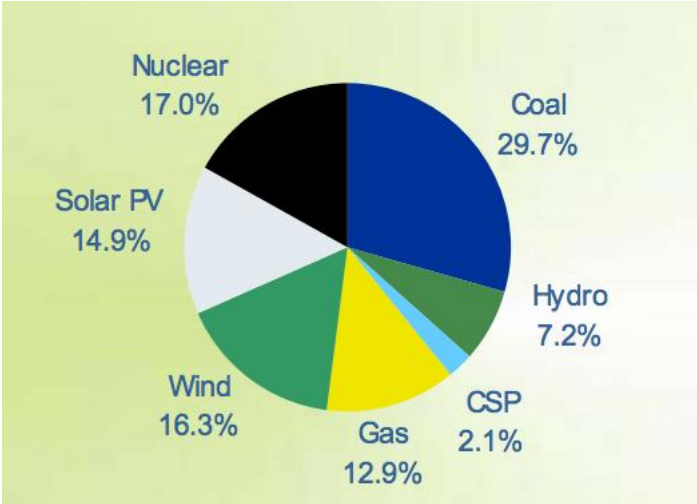


Chart 2: Gaining energy: Now and planning for 2030

## 2.2 Governmental structure and stability

Namibia is a republic. Namibia’s government consists executive, legislative and judiciary branches. The Cabinet is the executive organ of government, implementing the laws of the country. It consists of the president, the prime minister and his deputy, as well as the ministers. The Namibian government is partly centralized and partly regional. In the executive branch, central government consists of ministries, offices and agencies, whereas regional government consists of regional councils, and constituencies within these.

Every 5 year the people of Namibia choose a new president. But since the independency of Namibia in 1990, every election is won by Swapo and is seen as a dominant political party.

Source:(<https://www.revolvy.com/topic/Government%20of%20Namibia&uid=1575>)

Market segment analysis target market (age, income level, population estimate, other specific demographic and economic information) customer buying behaviour related to the proposed product and or service

Namibia is a country with a high developing economy. Also, the exporting of products and services is growing rapidly. Below you can see the development of the Namibian export in Namibian dollars (1 NAD = 0.066 EU). From 2001 till now the export rate of Namibia has grown an 700%. The expectation is that the Namibian economy will grow more the coming years. This means that the



Chart 3: Export of Namibia



The government of Namibia tries to stimulate the growth of the economy, the Namibian people are a part of the 'non-tariff barriers'. The non-tariff Barriers are 'Tariff Barriers (NTBs) refer to restrictions that result from prohibitions, conditions, or specific market requirements that make importation or exportation of products difficult and/or costly'<sup>1</sup>. Next to that you can see the countries that are a part of the 'non-tariff barriers'. All the neighbour countries of Namibia are a part of the non-tariff barriers.



Figure 1: Non-tariff barrier countries

Namibia has around 2,4 million inhabitants. The life expectancy of these people at birth is estimated to be 52.2 years in 2012, some of the lowest in the world.

The average wage in Namibia is N\$6626 per month per person. Namibia's economy is tied closely to South Africa's due to their shared history. The largest economic sectors are mining (10,4% of the GDP in 2009), agriculture (5,0%), manufacturing (13,5%) and tourism.

Namibia is the thirty-fourth largest country in the world. Namibia has 825,615km<sup>2</sup> of land. Being situated between the Namib and the Kalahari deserts, Namibia has the least rainfall of any country in sub-Saharan Africa.

Because of the 2,4 million inhabitants in a large country, Namibia has a population density of 3 people per km<sup>2</sup>. It is after Mongolia the sparsely populated country in the world.

### 2.3 Laws

To set up a company in Namibia you have got to deal with a few laws. There are several laws for import and export which will determine the total duty to pay. Over all the import duty is very high in Namibia to support the export and production in their own country.

To run HSE we will need a lot of employees. which will bring different employee-laws with the company. A few examples of laws are, work circumstances, minimum wages and a maximum working hours of 45 hours per week.

For the purchase and sales department, they must deal with a Value Added Tax (VAT) of 15% to pay to the government. And after all you must pay tax over your profits of 20,7%.

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<sup>1</sup> [http://www.tradebarriers.org/ntb/non\\_tariff\\_barriers](http://www.tradebarriers.org/ntb/non_tariff_barriers)

### III. PLANNED OPERATION OF THE PROPOSED BUSINESS/PRODUCT/SERVICE

#### 3.1 Proposed organization

HSE public limited company, is a Dutch manufacturer and project developer of sustainable energy technology. The company can be described if a small public limited company with around 4,000 international employees. The HSE is marked as an outstanding entrepreneur in the new energy valley. Below you can find the advantages and disadvantages of the ownership public limited company.<sup>2</sup>

Advantages	Disadvantages
<ul style="list-style-type: none"> <li>➤ Company is 'legal personality</li> <li>➤ Not Liable</li> <li>➤ Not Liable fort the debts</li> <li>➤ Brand awareness</li> <li>➤ Eassier to international trade</li> <li>➤ Creditors can only claim the money in the company</li> </ul>	<ul style="list-style-type: none"> <li>➤ Director chosen bij shareholders</li> <li>➤ Many requirements documents.                             <ul style="list-style-type: none"> <li>- Balances</li> <li>- Annual Report</li> <li>- Other Changes</li> </ul> </li> <li>➤ No reports, director is prosecuted</li> <li>➤ Lots of accounting                             <ul style="list-style-type: none"> <li>- Accounting documentation</li> <li>-Dossier drawings of each period</li> </ul> </li> </ul>

Figure 2: advantages and disadvantages

First of all we have to make a clear plan of everything. The start-up steps, planned personal, proposed staffing, financial marketing and, legal production. Below you can see a Organisation Chart of the Company.

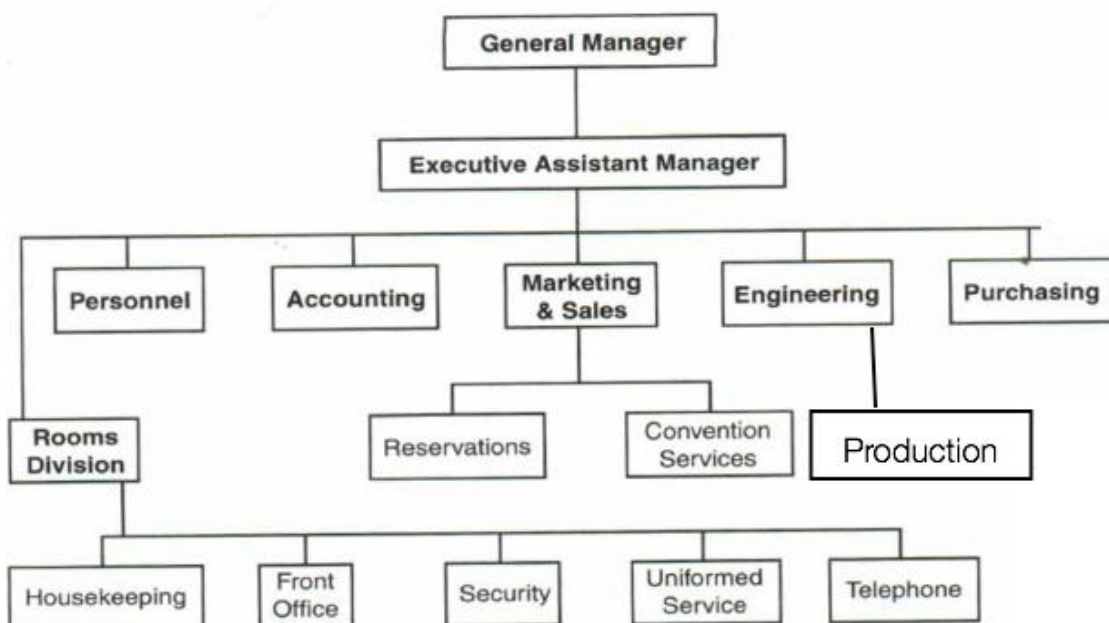


Figure 3: organogram

<sup>2</sup> <http://ukeurobv.nl/engelse-limited-ltd/meer-informatie>

### 3.2 Proposed product/service

HSE has a modular parabolic through plant that can generate between 100 MW and 1000 MW, theoretically this so called “the Chameleon” can generate even more MW but it is limited due to grid limitations. When expanding to Namibia the best option is to produce “the Chameleon” parabolic through plants.

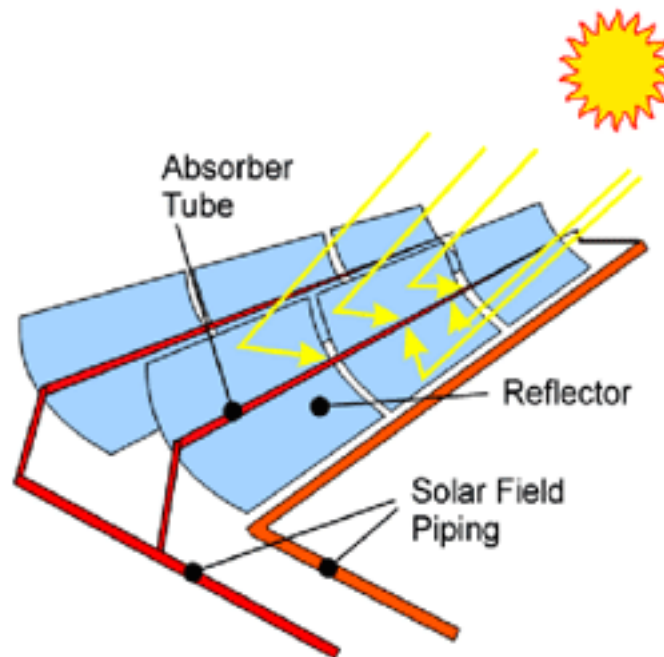


Figure 4: a modular parabolic through plant

As seen in figure 4 a modular parabolic through plant consist of 3 parts, the reflector, the absorber tube and the solar field piping. HSE could get these parts from “Abengoa Solar”. This manufacturer develops and applies technologies to generate electricity from the sun in South-Africa.

The advised inventory policy is to only produce when the order is in. So HSE doesn’t make many products which can’t be sold.

The modular parabolic troughs are transported by road. Since it is stated that HSE is exporting to South-Africa the distance is not that far. So pricewise it is ideal to transport them via the road. However there is some risk involved with this method. South-Africa is not the safest country, and with this high value cargo it is wise to hire special security guards who are driving in front of the truck to secure the security of the driver and the products. When investing in multiple trucks the costs may be quite high. For example one full truck almost costs \$50.000. But with securing the modular parabolic through it is recommended to use the companies trucks.

### 3.3 Proposed strategies & promotion

#### Proposed strategies

By setting our solar thermal factory on Namibia, we can take advantage of the low average wages (around 492.64€), that would make us save a lot of money comparing to home-factories (Dutch average wage is 2263€). This difference could make possible to save a huge amount of money, that can be invested in a lowered of pricing policies. Obviously, a country with Namibia's GDP (11.49 USD Billions, very low compared with The Netherlands 750.28 USD Billions) cannot effort our products in the same way of first world countries, so we can set lower prices in order to enter the market.

The local currency of Namibia is the Namibian Dollar, a currency with no international value, but with a high inflation (6.8%). On one hand, we can use the local currency to take advantage of the inflation. On the other hand, we can use an international currency as US Dollars or Euros. We will choose the first option because currency change of Namibian Dollar is too low (1 USD = 9,83 NAD and 1 EUR = 13,45 NAD), so we can use inflation in our favour. This strategy could be the most profitable, but also the most risky.

The principal costs the company will effort are employees training, factory construction and materials. Namibia's taxes import taxes are very low (4.4%), allowing us to import any necessary material, and infrastructures are good enough to enable the factory to be built. looking back to the costs, we can explain them:

Namibia's second grade schooling (high school level) is 59%, but third grade education (university studies) is only 6,4%. This means that it would be relatively easy to find workforce whit basic knowledge, but for most specific activities (maintenance, regulation of solar thermal panels, factory management...) local people should be trained or national employees should be transferred to the new factory. Both methods are expensive, and also training takes much time.

Factory construction would be obviously a cost, nevertheless, cheap workforce and cheap material will reduce this costs in a severe way. Manufacturing materials needed to build the factory and also to produce solar thermal panels are not difficult to find, reducing the amount of problems.

Principal mark-ups would come from setting the factory in a third world country, taking advantage from the cheap workforce, the government encourage to foreign companies to set in the country and the cash currency. We can take advantage of Namibia's inflation also.

Nevertheless, markdowns should be faced. The most important ones would be the cost of training local employees (economic and time costs) and communication costs with the HQ.

Talking about competition, the company would find a markdown in this area. Africa's first thermal-solar power plant is going to be constructed in Namibia, at Arandis, and will provide 26% of the country's electricity requirement. This plant could be a huge costumer for our plant, but also could attract other companies of solar thermal manufacturing to the area, increasing competition.

Apart from the features mentioned before, we should mention that the government is encouraging national energy production (Namibia imports around 60% of its energy requirement). This fact, both with the low export taxes, searches the set of new energy companies in the country, which are potential customers.

### **Promotion:**

Namibia is a traditional mining country, which main incomes come from diamonds and uranium exports. For this reason, both with the historical instability of the area, manufacturing industry is not developed. This means HSE would not find competitors in the area, creating a monopoly where price wars would not be necessary. For this reason, promotional activities should be focus on introducing solar thermal energy to local industries and institutions, because renewable energies are not commonly used in local infrastructures.

First of all, promotional activities should be done, like symposiums and meetings with the principal companies and institutions in order to explain the advantages of our product. HSE should focus its speech in the amount of money saved in energy export and the electrical independence that solar thermal panels offers.

After that, promotional programs could be set in order to introduce solar thermal panels to potential customers. The company expected that advantages provided by our product would have a call effect to the rest of companies and institutions. By this way, it could be consider to reduce sell price during the first stages of the market introduction, in order to set the real price when market starts to grow.

Media promotions are not necessary in this case, because is a kind of marketing directed to individual customers, and Namibia's inhabitant earnings are in general not enough to effort such a big invest in solar thermal panels for their houses.

## I. PLANNED FINANCING

To explain the financial part a balance and an income statement is made.

### 4.1 Balance sheet

The balance sheets that are made are made over 5 year. The first one is about the beginning of HSE in Namibia (2016) and the second one is made about the ending of the year (2021) For explanation about the chosen numbers on the balance sheet, we would like to refer the Appendix A.

Kolom1	Year 1	Year 2	Year 3	Year 4	Year 5
<b>Revenue</b>					
Sales	€ 629.848,25	€ 1.889.544,75	€ 3.149.241,25	€ 4.408.937,75	€ 5.038.786,00
Service	€ -	€ -	€ -	€ -	€ -
<b>Costs</b>					
Materials	€ 1.349.668,98	€ 2.699.337,96	€ 2.699.337,96	€ 4.049.006,94	€ 4.049.006,94
Wages	€ 591.168,00	€ 1.182.336,00	€ 1.182.336,00	€ 1.773.504,00	€ 1.773.504,00
Depreciation	€ 26.406,97	€ 26.406,97	€ 26.406,97	€ 26.406,97	€ 26.406,97
Interest	€ 17.100,00	€ 17.100,00	€ 17.100,00	€ 17.100,00	€ 17.100,00
D&P	€ 200.000,00	€ 200.000,00	€ 200.000,00	€ 200.000,00	€ 200.000,00
Transportation	€ 4.580,30	€ 9.160,60	€ 9.160,60	€ 13.740,90	€ 13.740,90
Total profit/los	€ (1.559.076,00)	€ (2.244.796,78)	€ (985.100,28)	€ (1.670.821,06)	€ (1.040.972,81)

The first balance sheet shows how HSE will start. At the beginning of HSE Namibia, our mother company with financing €1.000.000 in the new company. This is not enough for everything so there will be a mortgage of €250.000.

<b>Fixed Assets</b>		<b>Current liabilities</b>	
Land and Building	€ 751.244,00	Share capital	€ 980.000,00
Plant and machinery	€ 403.000,00	Reserves	€ 50.000,00
Other equipments	€ 25.000,00		
<b>Current assets</b>		<b>Non current liabilities</b>	
Inventories	€ -	Mortgage	€ 250.000,00
Cash at bank	€ 100.756,00	Loans	€ -
Total	€ 1.280.000,00	Total	€ 1.280.000,00

The second Balance sheet shows that the company is making a lot of losses in the past 5 year. This is because the company has to build up their connections and status. For this reason HSE Namibia has got a loan of €7.288195,53.

**4.2 Income statement**

The income statement is based on next 5 years. The first year we were only making a revenue of €629.848,25, this is because HSE Namibia is relating a period time of 3 times for the payment in 3 years. Further explanation about the income statement is receivable in Appendix B.

Fixed Assets		Current liabilities	
Land and Building	€ 672.494,85	Share capital	€ (6.470.766,93)
Plant and machinery	€ 352.571,45	Reserves	€ -
Other equipments	€ 22.142,85		
Current assets		Non current liabilities	
Inventories	€ -	Mortgage	€ 250.000,00
Cash at bank	€ 20.000,00	Loans	€ 7.288.195,53
Total	€ 1.067.209,15	Total	€ 1.067.428,60

## V. RECOMMENDATIONS/IMPLEMENTATION

After all the resources done, it has been shown that the best option for HSE is to invest in Solar Thermal Energy in Namibia. Not only the stable conditions but also the infrastructure, the import and export taxes and the location of Namibia, that makes it very attractive to investigate there. One problem of Namibia is the little population, but, the neighbouring countries of Namibia are ready to buy the products of HSE. The biggest customer will be South Africa.

At the moment, South Africa's primary energy supply is out of coal (92.6 %). The government of South-Africa have planned to reduce the energy supply out of coal to 29.7 % for 2030 and produce energy out different sustainable energy systems. Through the many experience of the company, HSE could be a good business partner for South Africa. The knowledge and the different sustainable power systems that we offer can help South-Africa achieve their goal.

The proposed strategy can be described as follows: We are setting our solar thermal factory in Namibia to take advantages of the low average wages (around 493,64 €). The average wages comparing to home-factories are saving us a lot of money. This money can be invested in a lowered of pricing policies. The third grade education of Namibia is very low (only 6,4 %), this means that it would be easy to find workforce with basic knowledge, but for the specific activities local people should be trained or national employees should be transferred to the new factory.

The competition that we can get in this area is at this moment is not frightening. The Namibian government is planning to build the first thermal-solar power plant in Arandis. The first power plant will provide 26 % of the country's electricity requirement. This plant could attract other companies to do researches to invest in Namibia. It is important for HSE to get this project.



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### Planned operation of the proposed business

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## APPENDICES

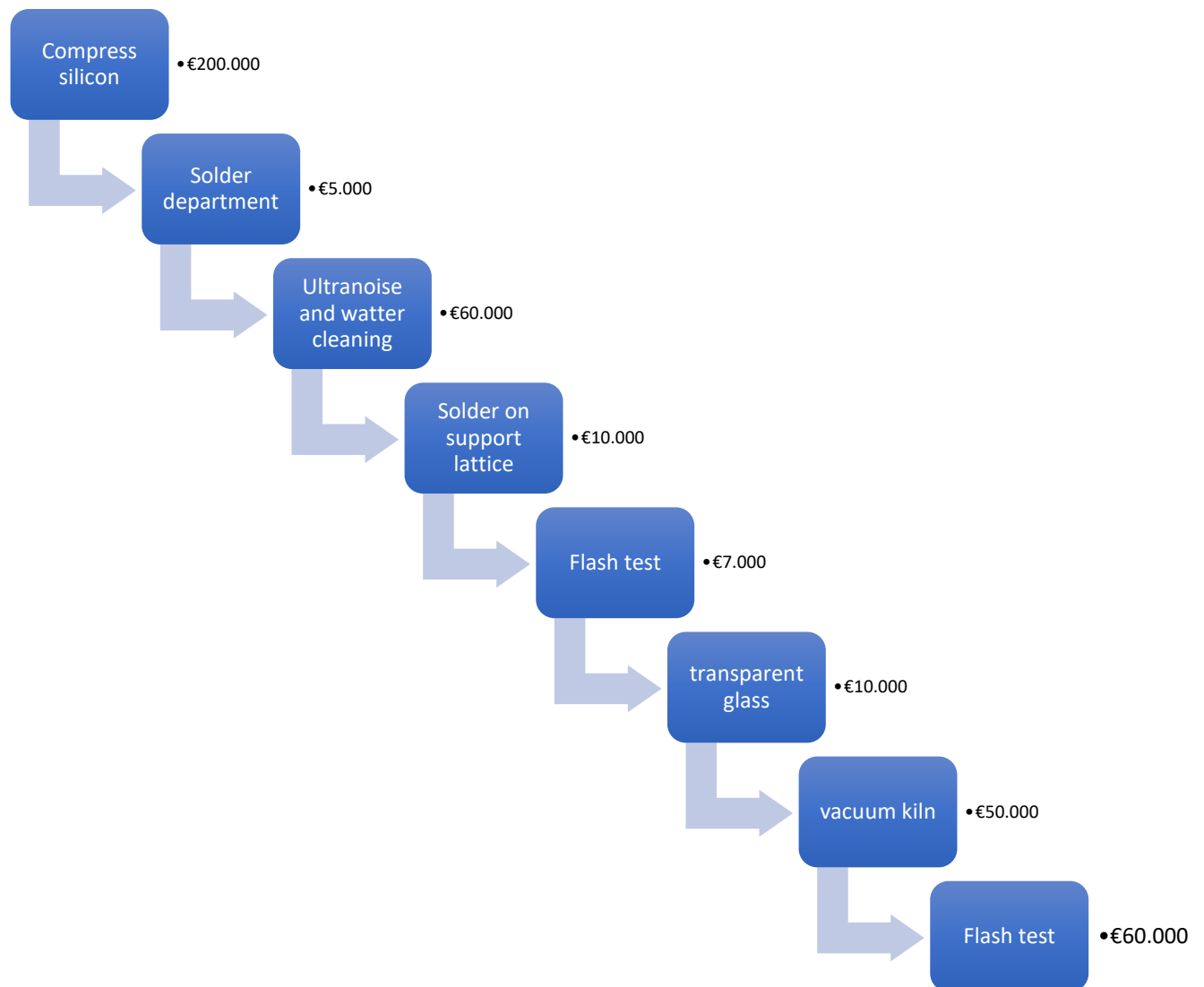
### Planned Financing

#### Appendix A: Balance sheet extra

##### Land and Building

Estimated on €751.244,00 because of the average costs of 144,47 per M<sup>2</sup> . Based on average ground needed for companies the building and land for HSE Namibia is estimated on 5200 M<sup>2</sup>. For the next 5 year the depreciation per year will be €15.749,83. Based on the scrap value of €100.000 and a life cycle of 35 years. In 5 years the value of the building will be €672.494,85.

##### Plant and machinery



Total costs is €403.000 based on the previous figure. In 5 years the value will be €352.571,45 caused by a depreciation of 10.085,71 per year, based on a scrap value of €50.000 and a life cycle of 35 years.

This is the same with the equipment's with a scrap value of €5.000 and also a life cycle of 35 years.

## **Appendix B: Income statement extra**

The revenue and costs of HSE Namibia is based on several solar panel producers worldwide and our own estimations.

### **The production and sales**

The production of solar panels is based on a site where they can produce 26 solar panels for €12.000. Based on the fact that they sell their solar panels with a profit percentage of 40%. This will be the same as HSE which also will sell their solar panels for €461,54 per piece. HSE is selling the park named "the chameleon" this park contains 4049 solar panels and this will produce a total of 1000 MW.

### **Depreciation**

Depreciation is explained in Appendix A.

### **Interest**

Interest is based on the Dutch numbers for the mortgage in Holland. The interest is based on a interest of 6,84%. Means:

$$€250.000 * 0,0684 = €17.100,00.$$

### **Transportation**

The transportation is based on the costs of a driver and the gasoline costs for the distance between Kaapstad and Windhoek (1479 km).

$$1479 \text{ km} / 3 \text{ km/L} \rightarrow 493\text{L} \rightarrow 493\text{L} * €0,925 / \text{L} = €456,03$$

The transportation of the solar panels asks for about 10 trucks. This means the total transportation costs + €20,- for the driver will be:

$$€456,03 * 10 \text{ trucks} + €20,- = €4.580,30$$