Feed-in-Tariffs in Malaysia

A turnkey solution to increase the actual amount of grid-connected generated photovoltaic energy?

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Summary

GBP International Sdn. Bhd. is a consulting and management organization continuously engaged in the fields of renewable energies (RE) and closely operating with the Malaysian Ministry of Energy, Green Technology & Water, which is the main addressee of this report.

Despite promotion efforts throughout the last nine years, the Ministry is facing the problem that the level of generated grid-connected photovoltaic (PV), which is a form of RE, only accounts for 0.0000416% of Malaysia's total energy generation. The mere implementation of an incentive called the feed-in-tariff (FiT) system, which pays individuals for the amount of RE they generate, should increase this rate by a factor of 8874 in less than 40 years.

The derived, inferential aim of this study is to analyse whether the FiT system in Malaysia is a turnkey solution to increase the amount of grid-connected generated PV energy or whether subliminal forces have a restraining or driving effect on the success of the implementation.

To get an impression of the energy generation sector in Malaysia it can be stated that it is dominated by gas and coal which account for 52% and 40%, respectively. Renewable energies account for 0.5%, of which the energy form of PV has the smallest share at the moment, yet most prosperous outlook.

Even though Malaysia is the fourth biggest manufacturer of PV modules, prices have been declining since years, PV's pros such as beneficial solar radiation exceed the cons by far and it has been promoted by several policies and promotion programmes during the central governmental five year plans, its share in PV generation is hardly recognizable.

Despite this marginal starting point, Malaysia's short term goal to 9-fold the level of generated PV within four years, by merely implementing the feed-in-tariff, is ambitious, yet it is historically achievable considering the varying FiT success of other countries, within the same time frame. The results of other countries has been the reason to examine which factors might influence the success of the FiT in Malaysia by using the force field analysis method.

A total of 23 forces, identified through literature review and previous analyses, have been rated by industry experts in form of an online questionnaire. According to the survey results 14 of these forces have a varying driving impact and the remaining 9 have a varying restraining impact on the success of the system. By weakening the 9 restraining forces and by strengthening the three smallest driving forces (as a safety mechanism) the achievability of the governmental aim increases.

These 12 examined forces were analysed in a standardized format including the origin of the force, its interview results and the respective situation in Malaysia, which all form the basis for conclusions and recommendations.

It is concluded that the FiT in Malaysia cannot be called a turnkey solution due to the varying impact of the analysed forces. This does not only have to be acknowledged by the organizations in charge, but actions such as simplifying and promoting the system, as well as guaranteeing a fair framework have to be initiated as soon as possible. The decisive factor for the success of the FiT implementation and the increase of grid-connected generated PV in Malaysia will be the pro-active and long term commitment of the Malaysian government and its corresponding ministries.

Content

Glossary

Economies of scale	The increase in efficiency of production as the number of goods being produced increases.
Feed-in-tariff	A policy mechanism or government incentive designed to implement renewable energy sources with the aim of accelerating the move toward grid parity.
Force field analysis	Technique of identifying and analyzing the positive factors of a situation that help ('driving forces') and negative factors that hinder ('restraining forces') an entity in attaining its objectives.
Force field diagram	Graphical interpretation of the forces affecting an certain issue.
Greenhouse gas	Composed of water vapor, carbone dioxide, methane and ozon, refer to gases in the Earth's atmosphere that prevent the release of heat into space and therefore maintain heat retention in the atmosphere of the planet.
Grid parity	Is the point at which alternative means of producing electricity is as cheap as grid power.
Grid structure	Means the whole configuration of an electrical grid from the generation over the transmission to the distribution. Its performance can be measured and compared by service reliability and distribution losses.
Malaysian Plan	5-year-planning of the Malaysian government concerning decisive strategic directions in the fields of infrastructure, health, environment, energy, agriculture and education.
Photovoltaic	A method of generating electric current from solar energy by using semiconductors that exhibit the photovoltaic effect.
Reserves-to-production ratio	The remaining amount of a non-renewable resource, expressed in years. The ratio is equal to the known amount of the resource divided by the amount used per year.
Solar energy	Electromagnetic energy (solar radiation) transmitted by the sun.
Solar thermal system	Form of power generation that uses concentrated sunlight to heat water or a fluid that is then used to drive a motor or turbine.

1. Introduction

Malaysia aims at increasing its level of grid-connected generated *photovoltaic* (PV) energy by a factor of 8,874 in less than 40 years. In Germany an increase factor of 50 would already be enough to cover Germany's whole energy demand only through the energy form of PV. The driver to mainly provide this increase in Malaysia is the FiT, which is the abbreviation for f*eed-in-tariff*. To verify and analyse whether the FiT implementation will be successful in Malaysia, a business-related report written on behalf of the management consultancy company GBP International and addressed to the Malaysian Government, is prepared.

The report goes beyond the stated title whether the FiT is a turnkey solution to increasing the amount of grid-connected PV in Malaysia, as it examines concrete forces and their impact on the success of the FiT. As the forces touch on many industries, this report is likewise relevant to journalists, consultants, ministries and private companies in the field of FiT and PV.

In order to identify the forces influencing the FiT implementation in Malaysia and embedding the whole system into a relevant rational context, secondary research of economic literature, as well as personal interviews with industry experts were conducted. In order to identify the impact of the forces on the FiT system an online survey was conducted.

Due to the number of respondents from the online questionnaire, a tendency, but not a statistical certainty is the outcome. In addition the research results are often restricted to a Malaysian point of view making the study partly subjective in descriptive chapters.

Regarding the structure, at first the management consultancy GBP International including their origin, structure, business activities and link to the Malaysian government is described. In the second sub-chapter the government and its departments relevant to PV and FiT are highlighted.

Malaysia's defined problem is that it has not been able to increase its amount of generated PV energy since the last decade. This situation should change by merely implementing the FiT system scheduled for the third quarter 2011. Checking on the feasibility of this statement and approaching it are the contents of the last two sub-chapters.

Malaysia's energy portfolio situation including the share of *renewable energies* (RE) and its relevant energy forms introduce the core part of the report.

As the energy form of photovoltaic is identified to be most promising, the actual situation and status, the key industry players, the pros and cons as well as the degree of promotion in Malaysia's policy are checked on.

As one upcoming promotional policy includes the introduction of the FiT within the 10th *Malaysian plan* the following chapter will start by presenting the FiT situation in Malaysia. As the FiT success varies around the world, it is assumed that forces have an influence on the success, which are identified due to the previous chapters and historical examples. In the last subchapter these forces are valued by applying the steps of the *force-field analysis*.

Conclusions and recommendations will embed the strategic advice of the forces in a concrete action plan. A critical appraisal will round off this report, mainly focussing on the borders and limitations of this project.

2. The organization

The organization presents the two main involved parties, which are GBP International Sdn. Bhd. and the Malaysian Government. It will present the main facts and figures of both parties and will furthermore identify their linkage.

2.1 GBP International Sdn. Bhd.

GBP International Sdn. Bhd. (GBP) is a "consulting and management organization" (GBP International Sdn. Bhd., 2011a), having their two headquarters located in Berlin, Germany and Kuala Lumpur, Malaysia. The company was founded by the current chief executive officer (CEO) Mr. Volker Friedrich in 1996 organization (GBP International Sdn. Bhd., 2011a). By harnessing on a network system consisting of several representatives, GBP is engaged in doing business in more than 15 countries worldwide. GBP International Sdn. Bhd. refers to the Malaysian headquarter which serves as a regional hub to focus on the Asian-Pacific core market (GBP International Sdn. Bhd. 2011b) (see appendix 3).

According to GBP International Sdn. Bhd. (2011c), its main business services can be divided into "research, business development and corporate services". In this triumvirate, research, forms the core competence including activities such as market studies and "sourcing opportunities assessments" (GBP International Sdn. Bhd., 2011c). Business development is the second focus which contains activities reaching from "strategy assessment to project management" (GBP International Sdn. Bhd. , 2011c). A minor part is related to corporate services including activities such as "company formation and start-up support (GBP International Sdn. Bhd. , 2011c). To put it in a nutshell, GBP conducts strategic and operational consulting activities in various business fields for companies with a focussed business interest in Asia.

GBP is engaged in the fields of RE in Malaysia through several projects and provides a framework for the recommendation report addressed to the Malaysian Government.

2.2 The Malaysian Government

The Governmental system in Malaysia is based on the framework of a federal "Constitutional Monarchy" (HighBeam Research, Inc. 2011) in which the King is head of state and the Prime Minister (PM) is the head of the Government and cabinet. The Current Malaysian Cabinet as announced by PM Dato' Seri Najib Tun Razak (Australian Government, 2011) on 9th April 2009 consists of the PM's and 25 additional deparments ((Office of the Prime Minister of Malaysia, 2011)
The *Kementerian Tenaga, Teknologi Hijau dan Air (KeTTHA)* is the Ministry of Energy, Green Technology & Water which is governed by the minister Y.B. Datuk Peter Chin Fah Kui who is responsible for all the decisions within the energy sector. (Najib, 2011)

In the governmental 8th Malaysian Plan the *Malaysian Building Integrated Photovoltaic* (MBIPV) was initiated to induce the long-term cost of PV (Haris 2010a). As of 13th January 2010 the national project leader, Mr. Ir. Ahmad Hadri Haris, reports directly to KTTHA which makes him the most relevant person to address this report to.

In future it is sensible to address the *Sustainable Energy Development Authority* (SEDA) of Malaysia (Haris, 2010b) which will be responsible for the sectors RE as well as *energy efficiency* (EE). According to Harris (2011), SEDA's main aim and focus will be the implementation and introduction of FiT system in Malaysia. A complete overview of the involved parties and their relationships is presented in appendix 4.

3. Project description

After introducing the relationships and relevance of the involved parties the project is described in this chapter defining the problem, project assignment and approach plan.
The problem definition states the problem the government is facing and moreover examines the causes and effects of this problem. From this problem statement a project aim is derived including the main research question and goal of the report. Consecutively the aim of the project is tackled by an approach plan, providing an insight on the involved methodology and presenting the procedure of research step by step.

3.1 Problem definition

In many countries around the globe the share of RE in the countries' energy portfolio has increased to double digits, reducing the amount of *greenhouse gases* (GHG) and lowering the dependency on finite fossil fuels. Examples which can be brought forward here are Austria (62%), Sweden (55.5%), Portugal (17.6%), Estonia (12%) and China (9.9%) (REN 21, 2010).

Malaysia, defined in this report as a country in the transition process from developing country to developed country, has not been able to increase its share of generated RE to a percentage exceeding the mark of 0.5 so far. Especially the importance of *solar energy* in Malaysia is simply not existent. In spite of possessing very good overall geographic conditions for using potential solar energy and as being the fourth largest producer of solar cells worldwide, Malaysia's level of generated grid-connected PV energy only accounts for approximately 0.0000416% of the total energy generation.

In the eighth *Malaysian Plan*, which reflects the path breaking governmental aims for the years 2001-2005, the amount of RE should have significantly increased through the introduction of the fifth fuel policy (Mahatir, 2003). In the ninth Malaysia plan (2006-2010) the *energy efficiency* (EE) and amount of REs should have considerably increased by promoting REs as the fifth fuel after oil, gas, coal and hydropower and by introducing the Malaysian Building Integrated Photovoltaic (MBIPV) project (Malek, 2010). It was anticipated that RE capacity amounted to 350 MW and 1.8% should consequently come from REs. As of 31.12.2009 these targets have been met by 15% (Haris 2010b).

For the second quarter of the year 2011 the Malaysian government has announced to introduce the FiT system for RE in Malaysia in the third quarter of 2011. This method anchored in the tenth Malaysian plan (2011-2015) should be the third attempt to promote and significantly increase the amount of generated grid-connected RE through a fixed governmental incentive (Suruhanjaya Tenaga, 2010).

To put in a nutshell the problem of the government is the significant low amount of REs, in particular in the PV industry. The government is stuck in this position since the beginning of the century and relies on the FiT system to change the distressed situation.

3.2 Project aim

Taking the results of the problem definition as a basis, the main research question to be answered in this report is: “Is the FiT system in Malaysia a turnkey solution to increase the amount of grid-connected generated photovoltaic energy or do subliminal forces have a restraining or driving effect on the success of the implementation?”

The consecutive goal is to provide recommendations within this advisory report on how to strengthen the potential driving forces and how to weaken the potential restraining forces, so the FiT system can have a significant impact on the PV share within the country’s energy portfolio as projected by the Malaysian Government.

3.3 Approach plan

In order to provide an answer to the main research question and main goal of the report a concrete approach plan will be presented within this chapter which is summarized chapter wise in form of an arrow diagram at the end.

By examining the share of all relevant energy forms in Malaysia with the help of energy journals, reports and magazines the topic and stance of RE is introduced. Splitting up RE in its relevant forms and looking at corresponding Governmental outlooks identifies PV as the most prosperous and sustainable form in Malaysia.

A definition of PV acts as introduction and explains the technical functioning as well as its simplified value chain. From this broad view the actual situation is analyzed, by taking examples from newspaper and online magazines. To check whether it makes sense at all to build on this energy form in Malaysia a pro and con comparison is executed within the next chapter. In a last step it is examined how many promotion and policy efforts were undertaken within the official 8^{th} and 9^{th} Malaysian Plan, which present the main strategic policy updates of the government from 2001 to 2010. Having a look at the 10^{th} Malaysian plan, which includes the years 2011-2015, it is stated that a feed-in-tariff is to be implemented in Malaysia to push the level of generated RE. The basic functioning of the FiT will be explained right away by giving a definition and combining it with a simple diagram.

As the FiT in Malaysia can be called a clean white hope it is checked in the next chapter how realistic Malaysia’s aims are by analysing the past success of the FiT system around the world. All the countries which have implemented the FiT are taken into account. The success is calculated by an increase factor involving a timeframe of four years to make the study it comparable. The success of the countries around the world is compared with Malaysia’s aims. As no statement can be given about the upcoming success in Malaysia at this point, a detailed in-depth analysis is required.

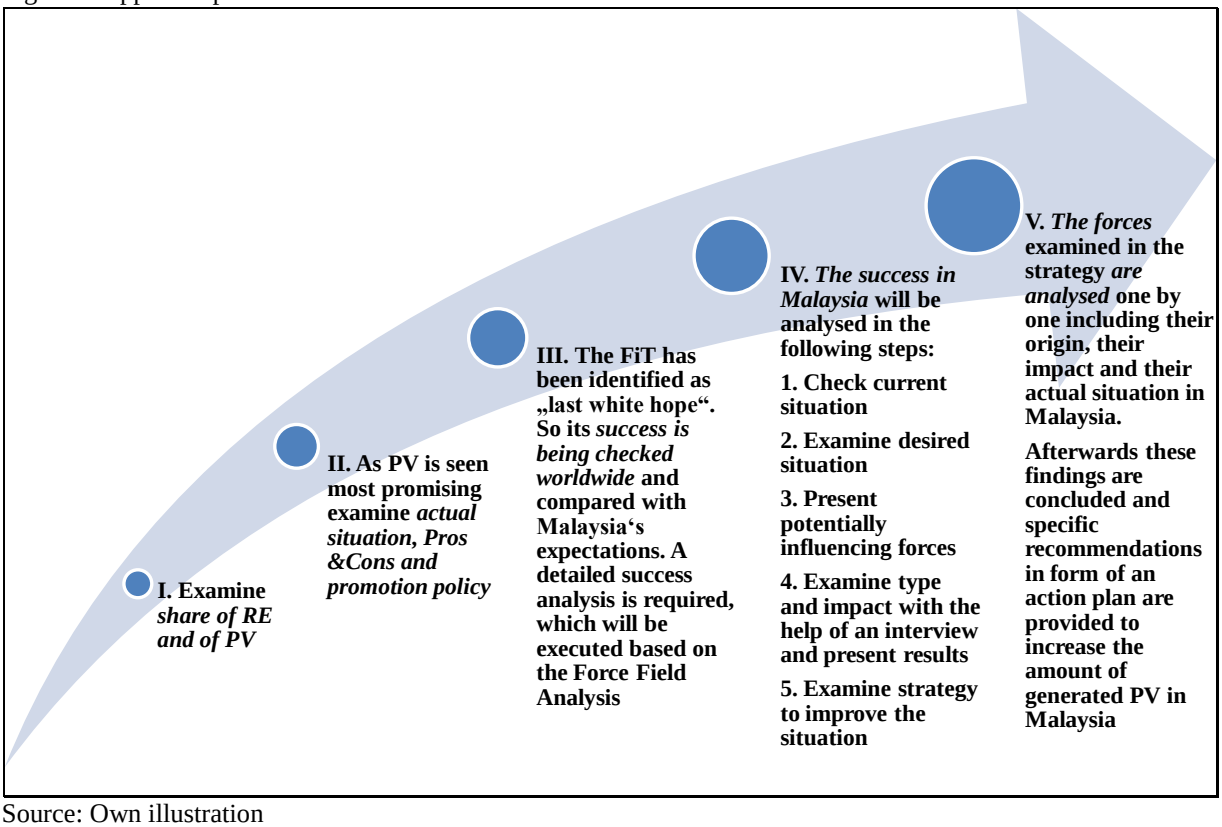
The force field analysis developed by Kurt Lewin will examine Malaysia's FiT success with the following procedure which will be applied step by step within one sub-chapter.

1. The *current situation* for the FiT and its link to the amount of generated PV in Malaysia will be described
2. The *desired situation* regarding the increase in PV is examined
3. It is assumed that *framework conditions* including specific *forces* might influence the success of the FiT implementation. These conditions and their forces are presented in a mindmap overview.
4. With the help of an online *interview* is being checked in the first place if these forces have got a driving or restraining influence on the success of the FiT and in the second place to which degree. The type and impact of these forces, which form the *results*, are presented in form of a force field diagram.
5. As a situation can always be improved it is checked with a *strategy* which forces should be analyzed in the next chapter.

The analysis will comprise the forces examined in the strategy which will be dealt with one by one. The analysis will include the origin of the force, the interview result and the situation in Malaysia.

At the end the findings of the analysis and the previous chapters will be concluded. Based on these conclusions recommendations are given. The final outcome will be an action plan for the Government stating which forces should be improved how, when and by whom. By implementing these actions the degree of success for the FiT implementation and consequently the increase in the PV capacity is more likely.

Figure I: Approach plan



Source: Own illustration

4. Renewable energies in Malaysia

This chapter shall classify the share of RE within Malaysia's energy sector. In the second part the outlook for each relevant RE form in Malaysia shall be assessed.

4.1 Share within the energy sector

In 2010 the installed capacity of generated electricity connected to the Malaysian grid amounted to 24,015 MW (Economic Planning Unit, 2009). The peak demand during this year summed up to 16,332 which lead to a reserve margin of more than 48% (Economic Planning Unit, 2010a). Due to the recovery of the Malaysian economy, the demand for electricity increased in the first half of 2010 by 8% whereas in the long run the energy demand is planned to increase by 5% per annum (Haug, 2010).

The actual five main fuel types in Malaysia, namely *gas, coal, hydro, oil and renewable energies* are presented below according to their share of generated energy.

Malaysia is a country which is according to Central Intelligence Agency (2011) blessed with a high amount of natural energy resources resulting in the fact that their main source of energy production is rooted in proven *gas* reserves of 2.35 trillion ccm estimated on January 1st 2010. In general gas therefore also has the highest percentage of *52%* in the generation of Malaysia's energy (Gabriel, 2011).

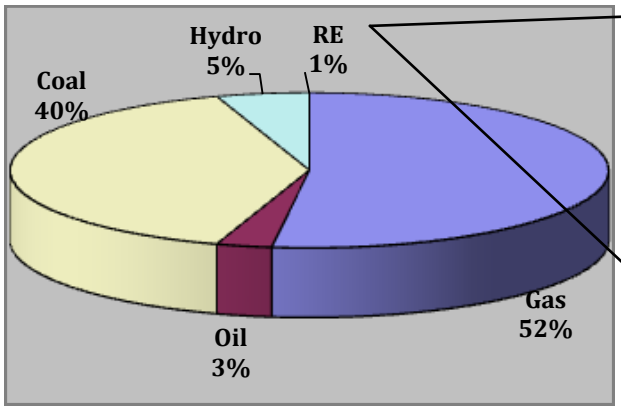
Since a few years the situation for *coal* has become more popular, which is mainly imported from China, Australia, Indonesia and South Africa (Asia Pacific Energy Research Centre, 2010). According to Gabriel (2011) it accounts for *40%* of the electricity generation, as it makes up for the recent gas shortfall in Malaysia.

Furthermore, Malaysia is producing energy from *hydro* power sources. Hydro consumption equals 2.0 million tonnes oil equivalent (BP, 2010). Its share in the generation mix of electricity adds up to an amount of 5%. In addition it can be stated that the potential for this energy source is more or less tapped in peninsular Malaysia but available in abundance in the two Eastern Malaysian states of Sabah and Sarawak summarized as Borneo (Gabriel, 2011).

Regarding the second biggest natural resource available, namely *oil*, the situation is similar to gas. Having proved oil reserves of 5.5 billion barrels, Malaysia can build on an reserves to production (r/p) ratio of 20.4 years on the basis of current production levels (BP, 2010). The difference to gas is that only a part of about *2.5%* is used for the generation of Malaysia's electricity. (Gabriel, 2011)

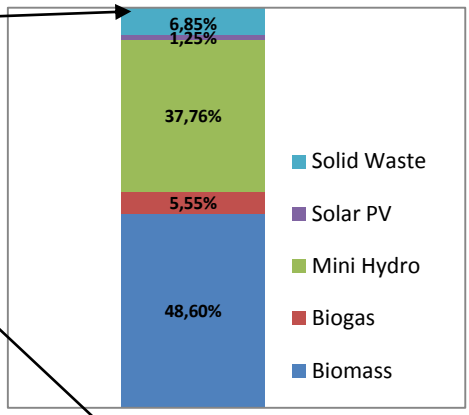
Renewable energies represent the fifth energy type, accounting for 43 MW of generated electricity which amounts to a share of *0.5%* (Gabriel, 2011). This amount is divided into the relevant RE forms of *biomass, biogas, mini-hydro, solar photovoltaic and solid waste* in Malaysia. At the moment biomass accounts for half of the amount of generated RE in Malaysia. It is followed by the energy form of mini hydro, accounting for approximately 1/3 of generated electricity. The energy forms solid waste, solar PV as well as biogas together account for the remaining scratch value of 13% in Malaysia's renewable energy mix (Haris 2010b).

Figure II: Share of RE in Malaysia



Source: Own illustration based on Gabriel (2011

Figure III: Share of RE forms within RE



Source: Own illustration based on: (KeTTHA, 2007)

4.2 Outlook for energy forms

The general tone in the media and from the government is positive regarding the future of RE in Malaysia. According to Harris (2010b) The potential impact of the National RE Policy by 2020 should save RM 2.1 billion of external costs on the basis of a total of 42 million tonnes of CO2 emissions valued at RM 50 per tonne. A minimum of RM 19 billion of loan values for RE projects which provide local banks with new sources of revenues and influences the economy. Furthermore a total growth of RM 70 billion in the RE business is anticipated creating a minimum of 52,000 jobs (on the basis of 15-30 jobs per MW) (Haris 2010b).

For a more detailed view the outlook of the five most relevant renewable energy forms namely biomass, biogas, mini-hydro, solid waste and solar, regarding the generation of energy in Malaysia will be presented in short.

4.2.1 Biomass

Especially biomass which has got the biggest share on generating energy of almost 50% at the moment is also a highly potential RE form in near future. Waste from palm oil production and forestation are used as resources for *"clean development mechanism"* (CDM) projects (Haug, 2010). At the end of 2008 there were a total of 53MW under construction. The official prognosis of KeTTHA (2007) states, that by 2040 1,340 MW of electricity will be generated from biomass.

4.2.2 Biogas

Biogas can be generated through waste water of rubber factories which again can "replace oil as a fuel for the thermal oil heaters" (Cogen3, 2011). For biogas the anticipated amount of 410MW generated electricity will reach its peak by 2028. At the end of 2008 an amount of 3.75MW was under construction (Haris, 2010b).

4.2.3 Mini-Hydro

At the end of 2008 17.8 MW of mini Hydro projects were under construction. The amount should rise to 490 MW by the end of 2040 according to the Ministry of Energy, Green Technology & Water (2007). The government states that this quota will already be reached by 2020 and its full potential will already be tapped by then (Haris, 2010b).

4.2.4 Solid waste

KeTTHA (2007) suggests that the amount of generated electricity coming from solid waste will rise to an amount of about 410 MW by the end of 2040. More precise 378MW will be reached by 2024 (at 30.000 tons/day of solid waste as projected by KPKT, followed by 3% annual growth post 2024). The total amount of generated electricity under construction as of end March 2009 was 8MW in total, from which 5MW should be imported to the grid (Haris, 2010b).

4.2.5 Solar energy

Solar energy is either „used to provide heat, light or to generate electricity" (Afzanizam & Barin, 2009 p.4). Solar energy as such is mainly separated into two parts. The first one is the *solar thermal system* (also known as concentrated solar power or CSP) which uses the heat component of the sun to generate electricity (active approach) or to heat up water for direct use (passive approach). Solar PV in contrast uses the light component of the sun to generate electricity (Afzanizam & Barin, 2009 p.8).

4.2.5.1 Solar thermal

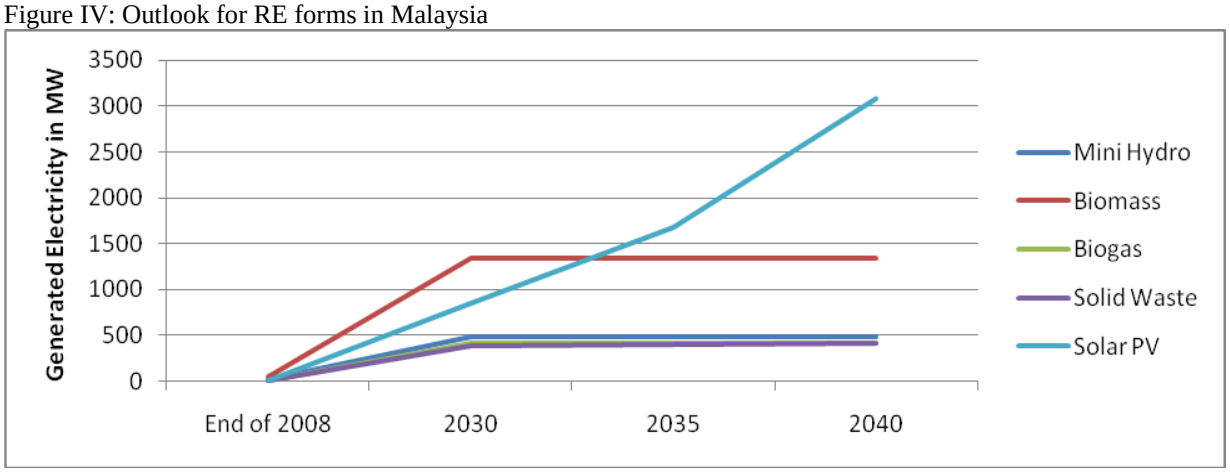
According to Rapp (1980), when a black surface is exposed to solar radiation, it heats up. As its temperature increases, the surface loses heat at an increasing rate to its surroundings. It is mainly used for water heating, air conditioning, the of agriculture products, water pumping and rural electrification (Singapore, 1987). The use of solar thermal system to heat water is common in Malaysia, but is also mainly restricted to this usage meaning that electricity with this system (active approach) is not generated to a large degree. Therefore it is left out for further analysis.

4.2.5.2 Photovoltaic

According to Harris (2010b), until 2030, 854 MW of PV should be connected to the grid. Looking even further into the future KeTTHA projects that 2040 an amount of 3.079MW and 2050 even 8.874 MW will generated from photovoltaic (Haris, 2010b). By then it would have become the far most important energy form within renewable energy forms and would also have quite a weight in the national electricity production. The status as of end 2008 concerning the amount of generated electricity accounts for 1MW in total (Haris, 2010b).

At the end the results of the various RE forms are shortly summarized in order to point out their potential for Malaysia more clearly. A more detailed diagram containing all the prospects from 2011 until 2050 in form of quantities numbers and within a diagram can be found in appendix 5.

Figure IV: Outlook for RE forms in Malaysia



Source: Own illustration based on (Haris, 2010b)

Table I: Generated energy per RE form in Malaysia

	Generated energy end of 2008 in MW	Proposed generated energy end of 2040 in MW	Rate of increase in %	Share of RE in 2040 in %
Mini Hydro	17.80	490.00	27.53	8.55
Biomass	53.00	1340.00	25.28	23.39
Biogas	3.75	410.00	109.33	7.16
Solid Waste	8.00	410.00	51.25	7.16
Solar PV	1.00	3079.00	**3079.00**	**53.74**
Total	**83.55**	**5729.00**	**3292.39**	**100**

Source: Own illustration based on (Haris, 2010b)

It can be seen from graph and table that biomass has got the biggest share in RE at the moment and will continue to have until 2032. After this date it is projected that solar PV will skyrocket in Malaysia (growth of more than 3000%) and will generate more energy in 2040 than all the other forms of RE forms together having a share of 53.74%. This is possible as solar PV usage is unlimited whereas the other solutions will largely be tapped by the end of 2030. This can be seen by the very flat curve in diagram IV after the year 2030 for every RE form except for solar PV.

As solar PV has been identified as the most perspicuous energy form in Malaysia for the long future, it will be analysed in more detail within the next chapter.

5. Photovoltaic in Malaysia

This chapter shall assess PV in Malaysia as its outlook has been determined as very prosperous in the previous chapter. At the beginning a short definition on PV is given. After that an industry overview is presented examining the actual situation of PV in Malaysia. After having presented the situation the pros and cons are assessed in order to determine the relevance for this specific energy form in Malaysia. In the last part the most important governmental policies, promotion efforts and programmes for PV from 2001-2015 are highlighted. In this context the upcoming promotion incentive FiT is defined and its outlook in Malaysia is presented.

5.1 Definition

„Photovoltaic refers to a technology which uses a device (usually a solar panel), [based on the photo electric effect] to produce free electrons when exposed to light, resulting in the production of an electric current" (Clean Energy Ideas, 2009). For a detailed description of the PV functioning see appendix 6. Until a PV system can produce electricity and is integrated into a building or implemented on a plain field there are five main steps along the product value chain needed. A detailed description of the PV product, its application possibilities and its value chain can be found in the appendix 7. Additional information on the origin and history of PV can be found in appendix 8.

5.2 Actual situation

Regarding the projects which are being realized at the moment it can be stated that there are 120 smaller projects listed on the Malaysian Building Integrated Photovoltaic portal (MBIPV) (2011 a) portal. These 120 projects represent a major amount of residential, commercial and industrial PV implementations in Malaysia from 1998 until 2011. A higher share of these projects have been set up and executed in the recent years which indicate that the market for PV is gaining importance. This may also be based on the fact that the Malaysian average BIPV price/kWp dropped as of December 2005 from RM 31,410 to 19,120 as of March 2010. This is a price reduction of more than 60% (MBIPV, 2011b).

The mentioned price reduction in Malaysia can especially be referred to the availability of big private companies engaged in all the steps of the PV value chain (see Appendix 9), especially when it comes to manufacturing solar PV panels. As of 2009 Malaysia has achieved to step up to being the fourth biggest manufacturer of solar PV panels worldwide after China, Germany and Japan (Afzanizam & Barin, 2009). Optimistic government prognosis even state that Malaysia will be able to overtake Japan at the end of 2011 as the Malaysian Government is actively marketing *foreign direct investment* (FDI) opportunities within this sector (Haris, 2010c).

Despite the facts that many small projects have been launched in Malaysia, the price has dropped significantly and Malaysia has been examined to be the fourth biggest manufacturer of PV modules, the situation regarding the amount of generated PV still looks jet-black.

As analysed in the first chapter the relevance of PV as a part of the total RE is almost not existent at the moment. Its share on the total amount of generated energy as of July 2009 in Malaysia was only about 0.0000416% (Haris, 2010a). This number is derived from the amount generated from solar PV which was 1,5MW as of July 2009 (Haris, 2010a) compared to the total amount of generated energy in Malaysia which amounts to approximately

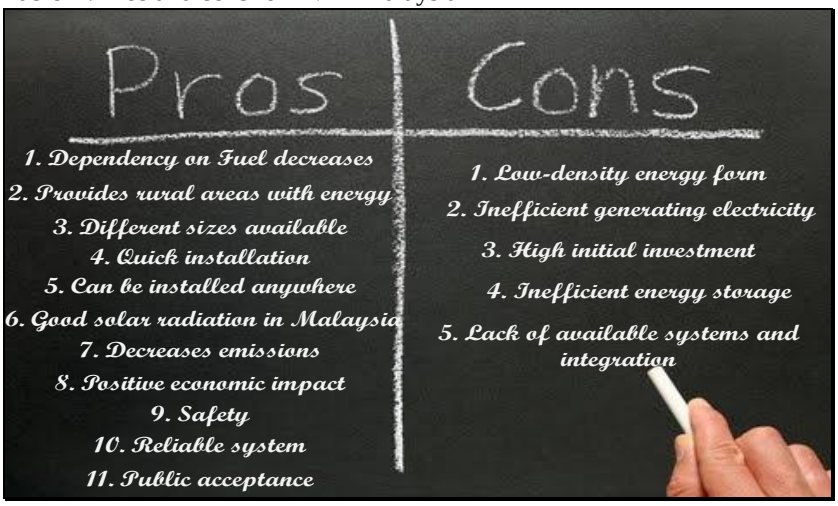
24.000MW (Economic Planning Unit, 2010a). Compared internationally this number is equal to the Gills Garden Kiyota, Sapporo city project, which represents a small district in Japan. Japan's total amount of generated PV electricity is more than 150 times higher than Malaysia's amount (Afzanizam & Barin, 2009). A more detailed country comparison can be found in chapter 6 later on.

As the actual status is defined as jet-black at the moment it will be identified within the next sub chapter whether PV has got the potential to lighten up or if this energy form will remain a spark of hope for the generation of energy in Malaysia.

5.3 Pros and cons

This chapter will present an argumentation based on advantages and disadvantages for the usage of PV in Malaysia. The pro and con arguments are listed in the table on the right hand side and will be explained one by one within two sub-chapters.

Table II: Pros and cons for PV in Malaysia



Source: Own illustration

5.3.1 Pros

1. Coal in Malaysia, as the second biggest energy source, accounting for 40% of generated electricity, is bought at market price and therefore vulnerable to volatile prices in the international market (Gabriel, 2011). In addition, although Malaysia still has abundant capacity reserves, a bottleneck could occur until 2015 through the reduction of the gas subsidies awarded to the international power producers (IPP) (Haug, 2010). This is due to the high amount of gas in Malaysia's electricity production of more than 50% examined in chapter 4. In both situations an increase in PV could *lower the dependency on finite fossil fuels*.

2. As the quality of the infrastructure differs largely between peninsular Malaysia and Borneo PV can help to *provide rural areas with energy*. As the connection to the national grid is very expensive and the plans for an underwater line between both areas have been cancelled (Haug, 2010), these off-grid solutions are crucial (Malaysian Photovoltaic Industry Association, 2009). The difference between grid and off-grid systems often also defined as standalone systems is described in appendix 10.

3-5. Advantages are also founded in the flexibility of the system. The system which is composed of several modules comes in *different sizes* to efficiently cover any type of roof (Environmental Business, 2010). According to Environmental Business (2010) an experienced crew can install a 2 kW non-battery PV system in two-to-four person-days, which provides a positive argument for *quick installation*. The last argument belonging to the

headline of flexibility is that PV systems can be installed at *any sunny point of interest* (Luque & Hegedus, 2003).

6. Malaysia lies in what may be called the "tropical solar belt" (Lucas et al., 1987), about 30°N and 30°S of the equator and therefore has a "consistent[ly good]" (Chen, 2009) *solar radiation available* (National Academy of Sciences & National Research Council, 1972). More detailed information on the topic of solar radiation in Malaysia can be found in appendix 11.

7. CO2 mitigation per person with a quota of 6.70 is almost five times as high in Malaysia as the Asian average (International Energy Agency, 2010a). It was acknowledged by the government in the 10th Malaysian Plan published by the Economic Planning Unit (2010b) that the quota was also higher than the world average of 4.35. In addition the emission intensity of 1.3 which is measured in tonnes of CO2 per US$1000 of GDP is almost double as high as the world average with an amount of 0.73. Regarding PV there are *no emissions*, no combustion or radioactive fuel for disposal.

8. PV in Malaysia is also assumed to have a very *powerful economic impact* assuming that every MW of PV installations would create about 500 full time domestic jobs composed of designers, installers, administrators, regulators, policy makers and suppliers (Malaysian Photovoltaic Industry Association, 2009).

9. The system is *safe* due to low temperatures, as electricity is generated through sun light, based on the photo-electric effect explained in appendix 6 (Luque & Hegedus, 2003).

10. The technical aspect of a *high reliability* of the modules lasting for more than 20 years can also be considered as a pro argument (Luque & Hegedus, 2003).

11. As PV is a clean form of energy this system has a high *public acceptance* throughout Malaysia (Luque & Hegedus, 2003). A "majority of the urban [population] believe adopting BIPV [is] the right thing to do for future generation and environment stake, [which is called altruism] (Haw, 2009).

The pro arguments can be summarized by taking the statement of Kheira Bettayeb (2011), head of the Energy program at CNRS who said: "solar energy is: clean, inexhaustible, and ubiquitous" (Bettayeb, 2011). Of course this is only the bright side of the coin and there are also a number of con arguments brought forward by industry experts.

5.3.2 Cons

1. One argument against the usage of PV (in Malaysia) is that PV concentrators can only use direct light which is not reflected "off of cloud, dust, the ground, or other objects striking the plane of a PV module at 90 degrees" (Well Development (International) Company Limited, 2007). For PV concentrators which can only use direct and not diffuse light, solar represents a *low-density energy form*.

2. In addition it is stated that the energy form is *not efficient in terms of generating electricity*. When it comes to generating electricity thin-film modules available in Malaysia have an efficiency of about 6%, whereas conventional crystalline silicon modules which are more expensive convert about 11-13% of the sun's energy into electricity (Solar Power Beginner,

2011). A detailed comparison of both modules can be found in appendix 12. Efficiency of fossil fuels is three times higher. The weighted average efficiencies are 35% for coal, 45% for natural gas and 38% for oil (Graus & Voogt & Worrell, 2007).

3. The range of unit cost of a solar PV system is RM 24,000-28,000 per kWp. For a bungalow the recommended PV capacity is on average 5 kWp resulting in an investment of RM 120,000 – 140,000 (Chen, 2009). This is a *high initial investment* for Malaysian people earning only about RM 42.000 in average (The Edge, 2008 P.83). Off-grid systems furthermore have the disadvantage that this mentioned energy storage device in form of a battery drives up the installation costs for a PV system.

4. Another main argument which holds for the off-grid systems in Malaysia is that there is a "lack of economical *efficient energy storage"* (Luque & Hegedus, 2003). This problem is acknowledged globally, but the problem, that a rather high proportion of energy is converted into heat, has not been solved.

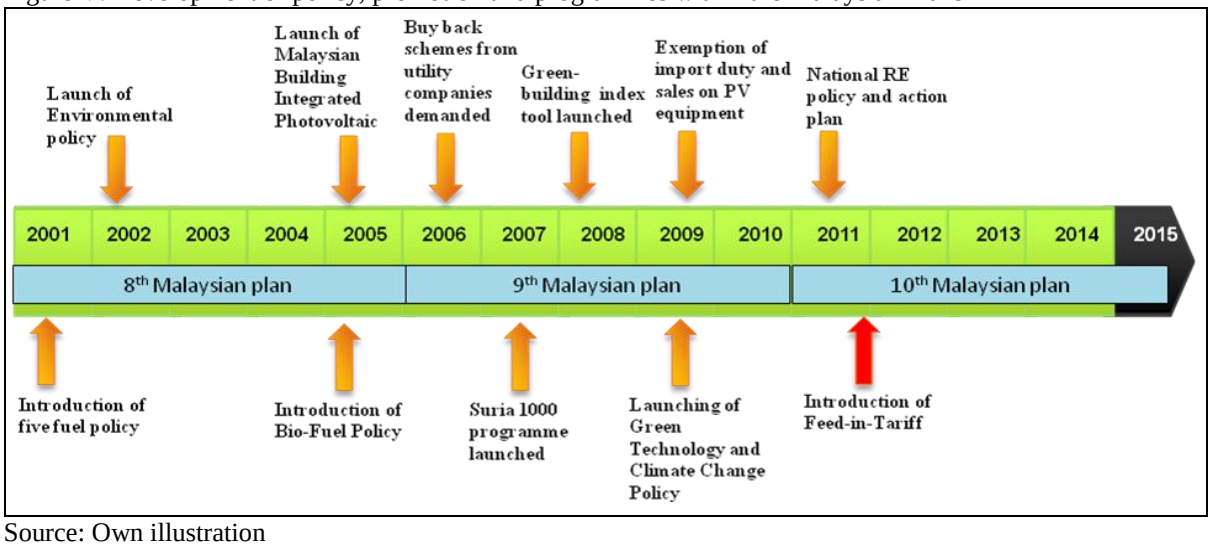
5. A last argument brought forward is that there is also a *lack of widespread commercially available system and integration [services]*, (Luque & Hegedus, 2003) as the technology is very new in Malaysia.

From the presentation of pro and con arguments it can be stated that there are more arguments for the usage of PV in Malaysia than there are against it. As intermediate result it can be stated that PV as such is beneficial in Malaysia, although it has a low level of generated electricity at the moment. In combination with the examined fact that the Government is the most prominent player coordinating and controlling the industry, it is shortly checked in how far this topic was, is and will be rooted and promoted in Malaysia's energy policy.

5.4. Development of policy, promotion and programmes

This chapter will assess which political direction was followed and which main promotional incentives were, are and will be applied to enhance the growth of PV in Malaysia. The incentives are clustered according to the 8th-10th Malaysian Plans, which represent the path-breaking strategic political directions, within the time frame of (2001-2015). The timeline below will help to visualize the main events and policies.

Figure V: Development of policy, promotion and programmes within the Malaysian Plans



Source: Own illustration

5.4.1 Eighth Malaysian Plan (2001-2005)

From 2001 onwards the Malaysian Government has tried to increase the amount of RE in their energy portfolio. During the 8th Malaysian plan a five fuel policy was launched making RE theoretically equivalent to gas, coal, oil and hydro. In addition the *Small Renewable Energy Programme* (SREP) launched on 11th May 2001 gives "small power generation plants utilising RE [the possibility] to sell their electricity to the utility through the distribution grid system [on a case by case basis] (Suruhanjaya Tenaga, 2011).

5.4.2 Ninth Malaysian Plan (2006-2010)

During the time of the 9th Malaysian Plan the incentives to promote RE increased and were in addition more tailored to the various RE forms. PV as such was mainly promoted by launching the Malaysian Building Integrated Photovoltaic (MBIPV) which declares in its objectives to assist within the PV industry by giving support for establishing local manufacturing facilities and by organizing round table discussions among a group of various stakeholders from industry, government and universities (Pusat Tenaga Malaysia, 2009). The national Suria 1000 programme launched in 2006 and ending 2010 presents an important incentive for PV in Malaysia. It is anchored within the MBIPV programme (Afzanizam & Barin, 2009) and targets at least 1000 kWp of building integrated photovoltaic, based on a bidding process which is open twice a year (MBIPV 2009). A part is attributed to "Suria for Developer" which is exclusively for property developers to "promote the widespread use of PV systems in buildings within residential developments in Malaysia (MBIPV, 2008). Although there are a lot of incentives mentioned in this paragraph the amount of generated electricity from PV is still far below expectations. This should change within the tenth Malaysian Plan described in the next chapter.

5.4.3 Tenth Malaysian Plan (2011 - 2015)

Within the 10th Malaysian plan announced on 2nd April 2010, the Government has announced to drive a new renewable energy policy, based on following self explaining five strategic objectives (Haris, 2011).

Table III: Strategic pillars of new energy policy

I	II	III	IV	V
Increase RE contribution in the national power generation mix	Facilitate the growth of the RE industry	Ensure reasonable RE generation costs	Conserve the environment for future generations	Enhance awareness in the role and importance of RE

Source: Own illustration based on (Haris, 2011)

The Government's *policy statement* declares that it is "enhancing the utilization of indigenous renewable energy resources to contribute towards national electricity supply security and sustainable socio-economic development" (Haris, 2011).

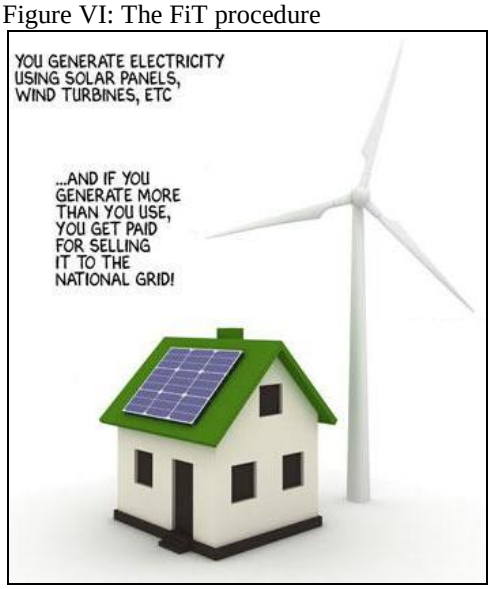
To implement this strategy and especially to facilitate the pillar number one of increasing the amount of generated power from PV and other *renewable energy sources* (RES) a new promotion incentive called the feed-in-tariff is on its way in Malaysia.

According to Hempling et al. (2010) FiT's "create a continuing obligation in the local utility to buy eligible renewable producers' output at standardized rates typically reflective of generation costs and under standard terms and conditions [for a specific duration]."

Looking at the definition and at the corresponding diagram the FiT can be defined as a simple rather simple system in its roots.

For the government, it is the clean white hope to leverage the amount of generated photovoltaic energy.

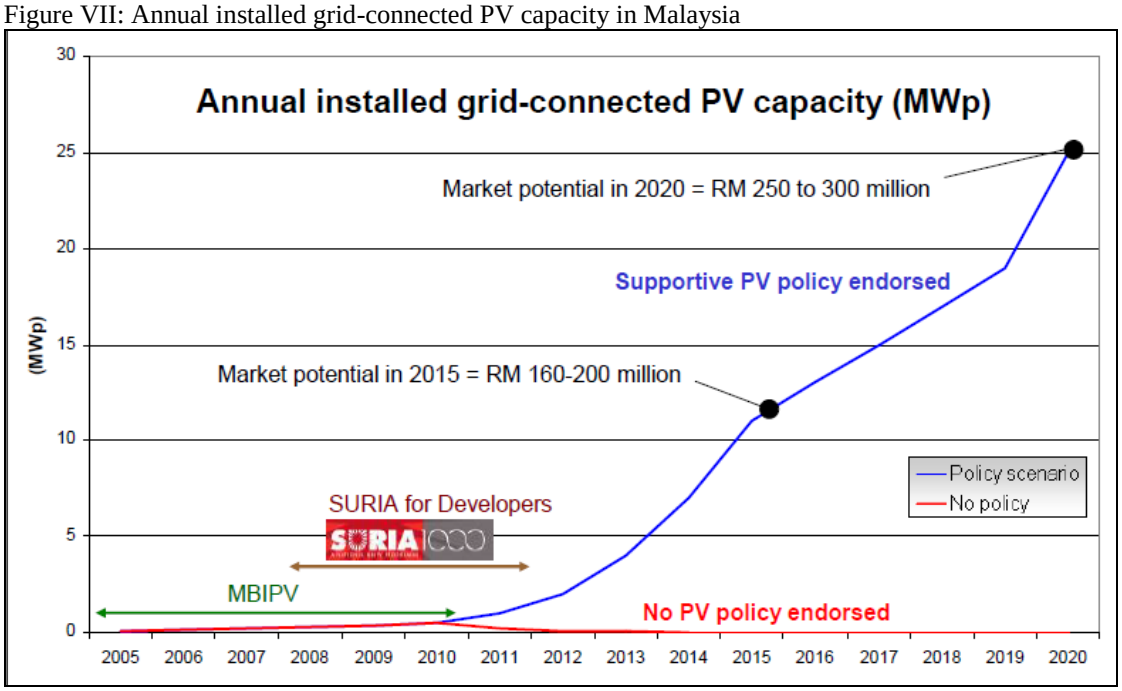
Figure VI: The FiT procedure



Source: Own illustration based on: **(BritishEco, 2011)**

To underline this statement, the past success and the projected impact of a supportive (including the successful implementation of the FiT) policy can be seen in the figure below.

Figure VII: Annual installed grid-connected PV capacity in Malaysia



Source: (Pusat Tenaga Malaysia, 2009)

Due to the high hopes of the Malaysian government for this system it is being checked within the next chapter how successful this system has been worldwide to prove if a very steep curve is realisable in Malaysia. This success analysis will give an idea on how far the FiT system has influenced the increase of PV on a worldwide basis.

6. The success of the FiT system around the world

This chapter examines the success of the FiT system around the world. In the first part the methodology including sample size and procedure is defined. In the second sub chapter the analysis results for a shortlisted sample size are presented. Within the last subchapter a conclusion is drawn, linking the results of the analysis to the possible success in Malaysia.

To the question if it is realistic that 5.5%/11% of overall electricity will be generated by RE (6.6%/8.5% from PV) in 2015/2020, the MBIPV national project leader, Ahmad Hadri, answered: "Yes, because the target is very modest to what has been achieved in other countries (closest to us is Thailand)" (Yee, 2011). This statement has been the initial reason to prove how successful other FiT countries are, regarding the increase of generated PV energy.

6.1 Methodology

In order to compare the results of all the countries which have already implemented a FiT system, to Malaysia, a timeframe criterion was applied. As Malaysia is introducing the FiT at the end of 2011 and the first results should be visible at the end of the 10th Malaysian plan in 2015, the resulting timeframe of four years was also applied to the sample size. A variance analysis has been compiled stating the actual amount of generated PV energy at introduction of the FiT and consecutively four years after it has been launched. Taking the introduction year of the FiT as a basis and comparing it to the amount generated four years later, a rate of increase is calculated for each country.

For this study a total of 52 countries which have implemented the FiT from 1978 until 2010 form the sample size (REN21, 2010). If only a part of a country (one or more states possessing own decision power) has introduced the FiT, the country is not taken into consideration for this study. At the end, reliable data has been found for 14 of the 52 countries. The countries having the highest and the lowest increase factor in PV generation after the introduction of the FiT are presented in the following table. A table of all the 52 countries belonging to the sample size can be found in appendix 13.

6.2 Results

Although every country has succeeded in increasing its amount of generated PV energy, four years after the introduction of the FiT system respectively, the results vary widely. On average the six presented countries in the table above showed an increase factor of 7.31, whereas all of the 14 examined countries grew by a rate of 3.86.

Table IV: Countries with the highest and the lowest rate of PV increase after FiT implementation

Year	Country	Generated PV energy at Year in MW	Generated PV energy at Year +4 in MW	Increase factor
1990	Germany	0.56	12.40	**22.14**
2003	South Korea	6.00	77.60	**12.93**
2005	China	68.00	305.00	**4.49**
1991	Switzerland	4.70	7.50	**1.60**
1994	Spain	5.70	8.70	**1.53**
1999	Norway	5.70	6.60	**1.16**

Source: Own illustration based on (Quaschning, 2010)

From the analysed 14 countries, Germany shows by far the biggest factor of increase. It has managed to 22-fold its share of PV within four years after introducing the FiT. Unsurprisingly Germany's success story regarding the FiT system can be found in various literatures which analyse how this overwhelming success can be manifested. In this study South Korea has also reached a very high increase factor of almost 13. China has managed to increase their overall amount of generated energy from PV to an amount of more than 300MW. Yet, due to their relatively high starting amount of 68MW their increase factor of 4.5 seems relatively small compared to the high risers Germany and South Korea.

For the European countries marked red in the table above the FiT introduction has had very little impact on the amount of generated photovoltaic energy. For Switzerland and Spain on the one hand the amount of generated PV energy has at least increased by 50% in contrast to Norway on the other hand which has only increased its share by 16%. Surprisingly Spain has managed to be the fastest growing country in the PV sector in the year 2008. From 2004 to 2008 it has managed to increase their amount of photovoltaic generated energy from 37MW to 3463MW (Quaschning, 2010). That is equivalent to an increase factor of 93.59 which exceeds the German quota by far.

6.3 Conclusion

As examined in chapter 4.2.5.2, Malaysia generated about 1MW of PV connected to the grid at the end of 2008. Without FiT this amount should increase to 7MW by the end of 2011 with the promotion incentives in place described in chapter 5.4. By 2015 and with the help of the FiT policy the amount of PV generated energy should increase to an amount of at least 55 MW according to a conservative study (Malek, 2010) and 65 MW according to an optimistic study (Yee, 2011). This would mean that an increase factor of 7.85 or 9.29 respectively is required.

Arguments sharing the opinion of Ahmad Hadri (Yee, 2011) that this is a realistic goal are manifested in the fact that two Asian countries have managed to achieve high growth factors of 4.5-12.9 as well. Within another study Thailand has also managed to achieve a PV grid-connection of more than 70MW (Malaysian Photovoltaic Industry Association, 2009). In addition it can be concluded that except for Germany countries which have introduced the FiT recently like China (2005) and South Korea (2003) have had a higher increase in PV than the European countries such as Switzerland (1991), Spain (1994) and Norway (1999). Arguments against the achievability of the Malaysian aim are that both the average figures of the six presented countries above (7.31), as well as the average of all countries (3.86), are lower than the conservative Malaysian prognosis of 7.85. In addition countries such as Switzerland, Spain and Norway have had a similar starting amount of generated photovoltaic of about 4-6 MW, but failed to increase this amount to a greater degree. Based on the analysis above it can be concluded that the planned increase factor for Malaysia of 7.8-9.2 is historically achievable but requires more research to give a founded opinion on the probable success of the FiT implementation in Malaysia.

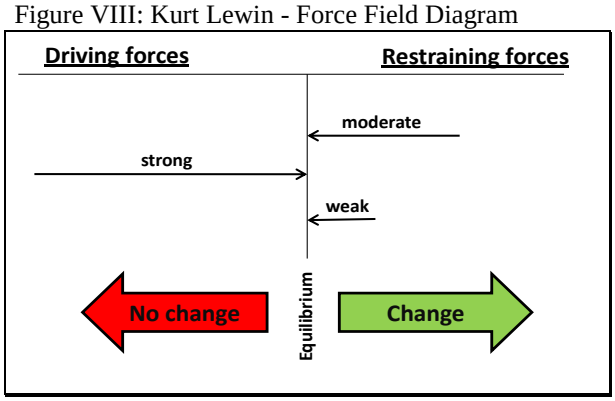
From this study it is obvious that the success of the FiT system regarding the amount of generated PV energy differs per country to a large degree. This leads to the result that at least shortly after the FiT introduction the system does not give the same output. With the help of the previous descriptive chapters on the Malaysian photovoltaic market and a problem analysis of the countries which have already introduced the FiT, it is being checked whether there are subliminal forces influencing the success of the FiT system and how they drive or restrain success in Malaysia.

7. The success of the FiT system in Malaysia based on the force field analysis

The success of the FiT system in Malaysia is analysed according to the fixed steps of the force field analysis developed by the American social psychologist Kurt Lewin. At first a target-performance comparison between the actual- and the desired FiT success situation are examined within the first two sub chapters. After this, forces which are potentially influencing the success of the FiT system are displayed. These forces are afterwards valued by means of an online interview. In the last sub chapter a strategy is created to focus on specific forces which are analysed in the following main chapter.

According to Kurt Lewin (1967) "An issue is held in balance by the interaction of two opposing sets of *forces"* – those seeking promote change (*driving forces*) and those atempting to maintain the status quo (*restraining forces*)".

Figure VIII: Kurt Lewin - Force Field Diagram



Source: Own illustration based on (Value Based Management, 2011)

His main assumption is that systems are not static patterns, but dynamic balances ("*equilibrium*") of forces working in opposite directions. For any change to occur, the driving forces must exceed the restraining forces, thus shifting the equilibrium (Value Based Management.net, 2011).

In order to achieve the aim of changing the equilibrium in Malaysia the following steps are executed one by one in a separate subchapter.

1. The current situation will be explained by examining the main players in the Malaysian FiT process and their functions.
2. The desired situation regarding the success of the FiT and consequently the increase in generated PV energy will be described.
3. Market conditions including forces driving or restraining the success of the FiT are presented.
4. An interview in form of an online questionnaire is conducted, involving Malaysian industry experts, to value the identified forces. The findings are presented within Kurt Lewin's *force field diagram* which shows restraining and driving forces on the success of the FiT implementation in Malaysia.
5. As a situation can always be improved, the results of the interview are taken as a basis to create a strategy which shall focus on increasing the success of the FiT.

7.1 Current situation

In the current situation PV plays no significant role in the amount of RE and certainly not in the amount of generated energy in Malaysia's whole energy portfolio. In order to change this situation the government is embarking on the introduction of the FiT in the third quarter of 2011, which pays individuals and companies according to the amount of PV energy they generate. A small overview of the main players and their functions in the FiT process is presented below.

At the moment there are five main parties involved in the FiT process in Malaysia presented in the following table and analyzed very shortly thereafter. A more detailed plan of the companies engaged in the FiT can be found in appendix 14.

Table V: Relevant FiT industry players

Institution	**Function**
1. Government + Departments	Sets RE goals and provides RE laws
2. Energy supply and service companies	Energy generation and supply of RE
3. Research and development institutions	Research and development on FiT
4. Generators	Participants of FiT as well as SREP
5. Consumers	Residential-, commercial-, and industrial sector consuming energy

Source: Own illustration

The [**Government** and their consecutive organizations] as the group with the highest decision power. They have approved the FiT in April 2010 and have embedded it into the *Renewable Policy and Action plan* integrated into the 10th Malaysian plan (KeTTHA, 2011). There are mainly two departments which have a direct link to the FiT.
The Ministry of Energy, Green Technology and Water (Malay abbreviation: KTTHA) administers the nation's energy, infrastructure, postal services and water functions. Within the energy department a sub department is responsible for RE and EE.
A department called *Sustainable Energy Development Authority (SEDA)* is being established at the moment. Its main functions are the implementation, management, monitoring and review of the FiT system (Haris, 2011).

According to Haug (2010), the energy supply in Malaysia is divided into two regional areas – the Malaysian peninsular and Borneo – which is being governed by three **energy supply and service companies**. The limited company Tenaga Nasional Berhad (TNB) which is closely linked to the Malaysian Government is responsible for the Malaysian peninsular. On Borneo the companies Sabah Electricity, which is 80% owned by TNB and Sarawak Electricity hold a supply monopoly in the states respectively. In addition 14 independent power producers generate electricity, and feed it into the grid of the three electricity companies for a fixed price.

Regarding the independent **research and development organization** there is one organization in Malaysia dealing with the FiT which is called *Green Tech Malaysia (*formerly known as Pusat Tenaga). Its main activities consist of energy planning and technological research, development and demonstration. It is defined as a "think-tank" on energy via consultancy providing linkages with universities, research institutions, industries other national and international energy organizations (KeTTHA, 2009 p.1).

The **generators** for PV are paid according to the level of installed capacity. The maximum rate of RM 1.23 per kWh is applied to facilities with an installed capacity up to and including 4 kWp, based on "gross electricity generated" (KeTTHA, 2009 p.9). When solar PV is integrated into buildings or building structures an additional 26 Sen are paid. When used as building materials, 25 Sen are paid and an additional 3 Sen are received for using locally manufactured or assembled solar PV modules (Yee, 2011). The minimum amount for PV is RM 0.85 if capacity level is above 10 MWp, up to and including the cap of 30 MWp. The lower amount for larger producers is founded in the "economies of scale" principle (Yee, 2011). The stated tariffs will be lowered each year after introduction, by an annual degression factor of 8% which should compromise for the price reduction in solar panels due to scientific and technological progress (Yee, 2011 P.12). For Solar PV the effective period of receiving these amounts is fixed for 21 years (KeTTHA 2009 p.4). Malaysia will also cap its level of PV to 9MW in the first year to ensure a cost effective compilation of the FiT. "Caps are essential to ensure that there would be adequate fund to pay for the FiT costs" (KeTTHA 2011b).

The FiT is not financed by the government, but by the **consumers** themselves who contribute an additional 1% to their electricity bill. Some 56% of Malaysians would not be impacted as they are exempted due to their consumption of less than 200kwh a month (Yee, 2011a p.22). The mentioned 1% is gathered in a RE fund governed by SEDA, which passes on the remaining 99% to the power utilities, namely solar BIPV buildings and Small Renewable Energy Program (SREP) developers. A diagram visualizing the RE funding flow for FiT in Malaysia can be found in appendix 15.

7.2 Desired situation

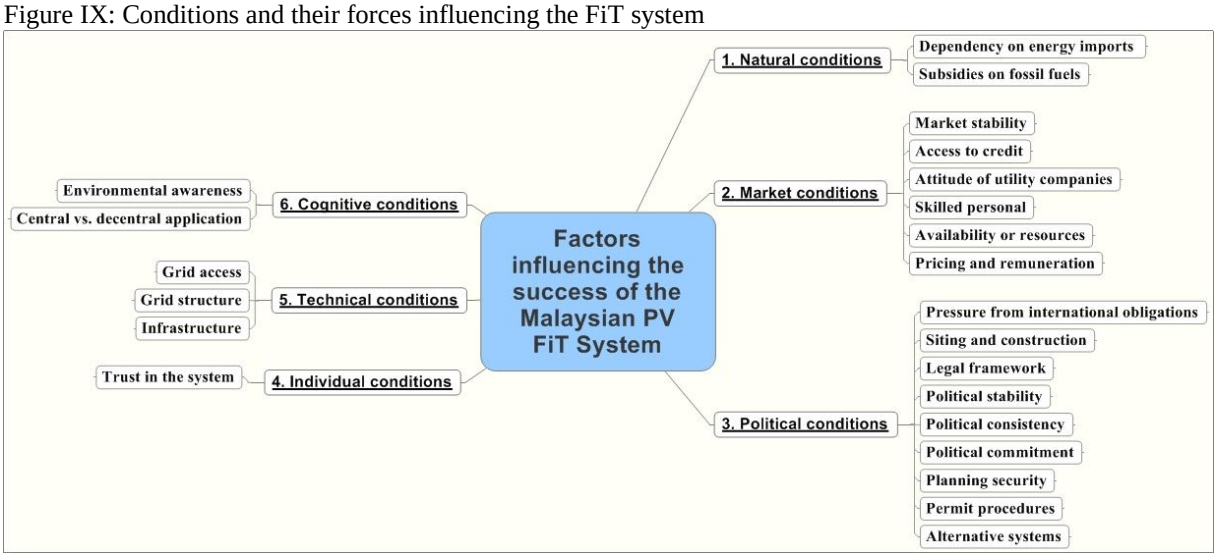
OSK Research head Mr. Chris Eng says the passing of Renewable Energy Act would be crucial to achieve the Government's targets: "I think key to driving the adoption of renewable energy at the end of the day would be the act [including the FiT]" (Yee, 2011a P.22).

It is projected that the FiT is the main driver responsible for an increase from 7MW in 2011 to 55 or even 65 MW by the end of 2015. As it can be seen in chapter 6, the FiT is not a "one size fits all" solution. Therefore forces which could potentially influence the success of the FiT implementation are presented in the following chapter.

7.3 Framework conditions including forces

A total number of 23 forces have been identified to potentially have an impact on the success of the FiT in Malaysia. They were gathered from experiences in countries which have already implemented the FiT and from the photovoltaic situation in Malaysia presented in chapter 6. A detailed description of the forces and their reasons for taking them into consideration can be found in the appendix 16. The forces are clustered into *natural, market, political, individual, technical and cognitive* framework conditions. The mindmap below provides an overview of these conditions and their corresponding forces which will be valued by the means of an interview presented in the next chapter.

Figure IX: Conditions and their forces influencing the FiT system



Source: Own illustration

7.4 Interview

The influence of forces is analysed by RE industry experts with the help of a quantitative online questionnaire. At first the methodology of the questionnaire will be explained after which the results will be displayed with the help of Kurt Lewin's force field diagram.

7.4.1 Methodology

The *aim* of the survey is to value the *type* and consecutively the *impact* of the forces identified in chapter 7.3 on the success of the FiT implementation in Malaysia.

The *method* used to achieve this aim is a web-based online questionnaire created with the online tool available at http://www.kwiksurveys.com, containing fixed questions aligned to a rating scheme. The form of a web-based online questionnaire was mainly chosen to guarantee a high number of responses within a short time frame. Additionally the system is easy to modify, can be assessed worldwide and can export the results into excel sheets after the survey has been conducted.

The *structure* of the questionnaire was separated into three main parts.

The first part was an introductory text which introduced the topic, duration, data issues and structure of the report which can be found in appendix 17.

The second part examined the contact details with the purpose to ensure that the people were knowledgeable about Malaysia's RE situation. Furthermore the participants were able to leave their email address, in order to receive the results of this survey afterwards.

The third part was the evaluation of all the identified forces presented in chapter 7.3. Every condition and its corresponding forces were presented on one separate page. Every single force was structured in the same way. The title and a short explanation were given first. After that the participant was obliged to rate the force according to his personal opinion within two steps. In the first step he identified whether the force was driving, restraining or not influencing the success of the FiT in Malaysia at all. If he decided for one of the first two

options he would rate one of the two options between 0 and 10 and the counter option “0”, in the second step. If a force has no impact for him both the driving and restraining force are valued with the score “0”.

In order to guarantee a sufficient number of participants as well as a high qualitative outcome, a *strategic approach plan* was applied.

To ensure a sufficient *qualitative result* a criterion was applied stating that only people who have “a clear relationship to the RE sector in Malaysia, preferably PV” are eligible to fill in the questionnaire. This has been done to ensure a qualitative result and not to waste time of people which could not answer the specialised questions due to a lack of knowledge.

The *quantitative aim* was approached by embarking on the *snowball effect*. Due to the limited number of contact persons as of 18.04.2011, several existing GBP contacts, clients and colleagues were contacted via telephone before the interview was officially launched. They were asked to distribute the questionnaire and promote the topic within their global networks, with the restriction that the person had to have a clear connection to the Malaysian RE industry. In order to make it as convenient as possible for these persons, fixed email templates were prepared and send to these contact persons. By stating in the email that the questionnaire should be distributed to relevant people within the RE sector in Malaysia a snowball effect occurred. The main contacts sent it to their contacts which again spread it within their networks to a certain degree.

The survey was conducted within the timeframe from 18th April - 30th April, 2011. The total responses received summed up to 23, of which 14 were entirely filled in questionnaires. 9 out of 23 respondents have therefore filled in an incomplete questionnaire.

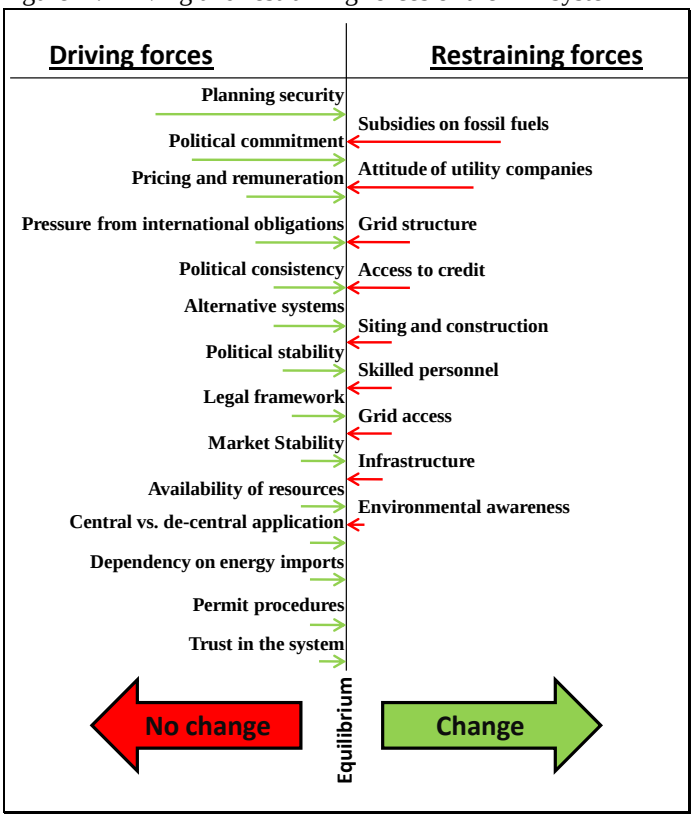
The *limitations* resulting from the paragraphs above are that it was not possible to track the total sample size of the survey. The procedure that contacts forward the questionnaire to their network which again forwarded it to their contacts drove the amount of participants, but at the same time made it impossible to track and calculate the exact sample size. This led to the situation that it was impossible to promote the questionnaire and the topic within the whole network. To overcome this problem the key persons were contacted over and over again to promote the questionnaire in their networks. Furthermore the total amount of 23 respondents does not represent a statistical survey but more an indication on what the situation for the FiT and PV looks like. At least these indications are based on the fact that every respondent has a clear relationship to PV in Malaysia. Further restrictions and limitations are evaluated in the critical appraisal.

After the methodology of the survey has been described the results of the survey are presented in the next chapter.

7.4.2 Interview results

In total 23 people filled in the questionnaire presented in appendix 18. These 23 people are composed of consultants, executive directors, CEOs, technical directors and journalists which all have in common that they have a relationship to the PV industry in Malaysia. Often the participants have come across PV due to their company origin or, especially consultants, because of projects they have led and executed. 21 of the 23 respondents have submitted their email address and would like to receive the results in form of the force field diagram presented on the right hand side.

Figure X: Driving and restraining forces of the FiT system



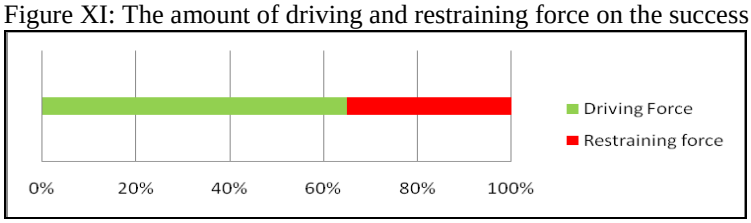
Source: Own illustration

After the results of the section "contact data" are presented above, the main results dealing with the forces influencing the equilibrium or "status quo" will be highlighted according to the force field diagram. The equilibrium is equal to the success of the FiT implementation in Malaysia which directly correlates to the amount of generated PV energy in Malaysia.

Summarized the 23 participants commented on a total of 23 forces presented in chapter 7.3. The results show that every force either has a driving or a restraining effect on the equilibrium. Driving forces are presented in the left part of the table and marked with "positive" green arrows, in contrast to the restraining forces, with red arrows, presented on the right side of the table which are maintaining the status quo. However the force field diagram representing the results of the interview indicates that the amount of forces is not split up evenly. Summed up there are 14 forces driving the success of the FiT and 9 forces which are restraining it. As the participants were not only asked to define whether the force is driving or restraining the success, but moreover to indicate to which degree the force is impacting the success, more conclusions can be drawn.

The length of the arrows indicates their impact on the "status quo". For reasons of simplicity the forces and their arrows have been structured according to their impact on the equilibrium. The longest and therefore most important forces are presented at the top of the table whereas the forces with the smallest impact can be found at the bottom of the table. Referring to the paragraph above not only the amount of driving forces but also its value exceeds the value of the restraining forces. The calculated result can be found in appendix 19 and is visualized in the diagram below.

Figure XI: The amount of driving and restraining force on the success of the FiT



In this diagram 50% presents the equilibrium where the impact of both forces would amortize.

Source: Own illustration

Regarding this survey the driving forces are pushing the success with a total of about 65%, whereas the restraining forces are blocking it with the remaining 35% in total. Assuming the result is representative would mean at this point that the FiT implementation will be successful to a certain degree and change will occur, as there are more examined forces driving the success than there are forces retraining it. Yet, as analysed in chapter 6 Malaysia's Government has a very ambitious aim regarding the FiT as a tool to increase the generation of PV. Based on these interview results it is therefore checked within the next chapter how the success of the implementation can be increased so the probability of achieving an ambitious aim increases as well.

7.5 Strategy

The targets mentioned in chapter 7.2 "Desired situation" will be achieved more likely when change occurs. There are three possibilities to increase the degree of "favourable" change based on the force field analysis.

1. The driving forces are strengthened
2. The restraining forces are weakened
3. A combination of 1 and 2.

In the original diagram change occurs unrestricted if there are no restraining forces blocking this particular change or maintaining the status quo. Therefore the restraining forces examined in the Force Field Diagram are analysed first.

As it cannot be guaranteed that the restraining forces can be reduced to 0, it is also crucial to focus on improving the driving forces where possible. Only driving forces with the lowest impact will be taken into consideration as they yield the biggest room for improvement. Forces which are already strong are therefore not taken into account. As a line has to be drawn somewhere to guarantee a detailed analysis of all the forces, only the three weakest driving forces are taken into consideration.

Before arriving at recommendations at the end of this report the forces are analysed first within the next chapter.

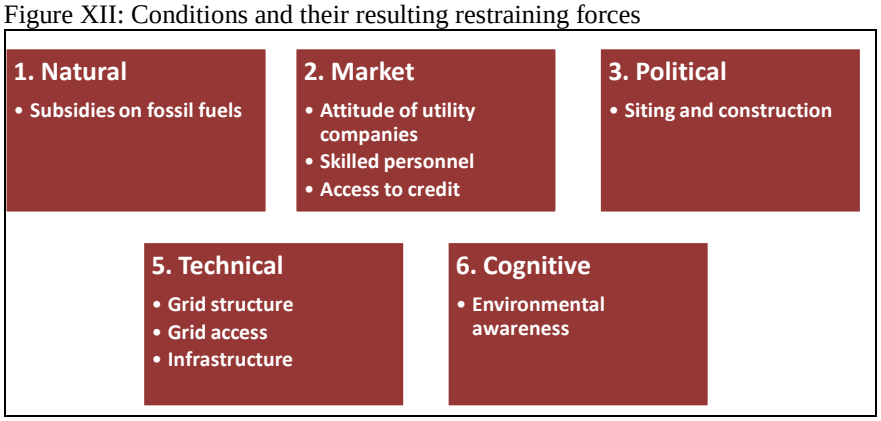
8. Analysis of forces

In this chapter the restraining and driving forces, according to the strategy presented in the previous chapter, will be analysed. As the restraining forces block the change at the moment they are analysed first, before examining the driving forces in more detail. For each single force, the reason for taking this force into account, the interview result and the situation in Malaysia will be presented.

8.1 Restraining forces

To have a recent overview of the forces which are determined to be restraining, an overview is presented. The forces are presented in form of the framework conditions they correspond to, which have been examined in chapter 7.3. Each force is being analysed within their framework condition.

Figure XII: Conditions and their resulting restraining forces



Source: Own illustration

8.1.1 Natural conditions

Natural conditions contain potential forces dealing with PV as an energy form compared to fossil fuels. In this subchapter only the force "subsidies on fossil fuels" is analysed.

Subsidies on fossil fuels [in generating energy] were taken into account as there might present a distortion of competition according to their occurrence *(*Mendonca, 2007). The assumed underlying equation is that with every Sen spent on the promotion of fossil fuels in form of subsidies the interest in RE decreases and vice versa.

According to the interview results, the participants named subsidies on fuels to have the highest restraining impact on the success of the FiT. One participant of the interview believes that the RE policy the government has been initiating is just about talking as Malaysia is following a very "questionable bio policy" as well (Online survey, April 2011).

In Malaysia "subsidies were reported to have cost the Malaysian government USD 14 billion in 2008, or about 4% of GDP" (IEA et al., 2010). The highest share of subsidies on fossil fuels on a worldwide average is imposed on oil, followed by gas and last but not least, coal. Although coal might only make up for a small percentage of subsidies worldwide, 90% of the subsidies are used for generating electricity and only 10% are passed on to the end user (International Energy Agency, 2010b). The International Energy Agency states that in 2008 Malaysia has ranked 16th in imposing subsidies on fossil fuels (International Energy Agency,

2010b). Since 2008, Malaysia has already made "notable reforms to bring their domestic energy prices into line with world prices", by introducing "a broad package of reforms (subsidy reduction, cash rebate etc) to their energy subsidies" (IEA et al., 2010). In August 2008 the price of natural gas for power generation was raised by 124% and the average electricity rate was increased by 24% in line with its gas price increase (IEA et al. 2010). The 2010 budget announced a saving scheme of RM 2 billion which would be overlooked by a new unit responsible for the review of all forms of subsidies.

8.1.2 Market conditions

Market conditions contain forces concerning the overall PV and FiT market situation. In this chapter the forces "attitude of utility companies", "access to credit", and "skilled personnel" are analysed.

8.1.2.1 Attitude of utility companies

As utility companies are examined as an own group linked to the government in chapter 7.1 it was originally checked if the ***utilities' attitude*** is "intolerant of competition from other (often smaller) investors *(*Mendonca, 2007).

According to the interview results, the attitude of utility companies is examined to have the second biggest restraining impact on the success of the FiT implementation in Malaysia. Additionally a comment from the interviews concluded that utilities (Tenaga Nasional Berhad, Sarawak Energy Berhad and Sabah Electricity) have no interest in buying RE powered electricity as they enjoy better profits from subsidised gas prices for power generation (Online survey, April 2011).

To recap the situation for utility companies in Malaysia is shortly updated. „Under the Small Renewable Energy Power Programme (SREP) [as well as for the upcoming FiT], small power plants utilising renewable energy can apply to sell electricity to the utilities companies through distribution grid systems (Selamat & Abidin, 2011). In terms of renewables the function of the utility company is therefore more or less restricted to distribution purposes. When generating electricity themselves based on subsidised fossil fuel prices and distributing this generated energy, the profits should be much higher for the utility companies. That is why they would like to restrict the government's plans of introducing the FiT. The utility companies might be an important player in the FiT process as examined in chapter 7.1, but when compared to the Government who controls the energy industry through their policy, it has to subordinate. One recent example to proof this statement, was the decision of Sabah Government „against building a coal-fired power plant in Lahad Datu[, Sabah]", because of „environmental risks close to key pristine conservation areas" (Sario, 2008).

8.1.2.2 Access to credit

The next factor is the granted ***access to credit*** as in chapter "5.3 Pros and cons [of PV]" it is examined that PV is coupled to very high initial investment costs.

The results of the online surveys suggest that access to credit has a medium restraining impact on the success of the FiT implementation in Malaysia. Additional comments are that credits are easily awarded to Bumiputras (Malaysian locals) but the process is full of restrictions for foreign companies (Online survey, April 2011).

The Malaysian Photovoltaic Industry Association's (MPIA) five-year plan, to produce 2,600MW per year from rooftop PV systems, would require an estimated RM5.6 billion on credit through various sources, assuming that cost for a 1.0 KWp capacity, that requires 10 sq m of roof area, the initial investment cost is around RM16,000 to RM18,000 (Loh, 2010). Talks with the banking industry have been conducted stating that development and commercial banks are willing to issue credits such as in „Putrajaya and Sha Alam" (Loh, 2010). For the industrial and commercial sector (BNM Annual Report 2006) there were 94 Government funds/financing schemes with a total allocation of RM25 billion made available (Bank Negara Malaysia, 2007, p. 13). Individuals can apply for loans as well, but this is perceived as a lengthy procedure as many documents are requested.

8.1.2.3 Skilled personnel

A further force identified is the ***skilled personnel*** situation, as smooth market functioning requires low-cost access to requisite skilled workers *(*Mendonca, 2007).

The interview results examine that the skilled personal situation has a rather small restraining impact on the success of the FiT implementation in Malaysia. A comment points out that an improvement on the skilled personnel situation is heavily dependent on government subsidies such under the Suria 1000 & the rural electrification program (Online survey, April 2011).

In Malaysia a high number of qualified workers in the solar PV industry will be needed if the desired amount of generated energy should rise to 65MW in 2015. As stated in chapter 5.3, it is assumed that every MW of generated PV will lead to about 500 full time domestic jobs, composed of designers, installers and so forth. This would lead to a demand of skilled workers of 32,500 in only four years. In the EU it has been examined that especially high skilled academics in the fields "physics, chemistry and engineering" (PV Employment, 2011) as well as skilled labourers such as "technicians and electricians" are needed. At the moment in Malaysia a high amount of the workforce will be needed for production purposes solely. As the amount of PV increases throughout the years more skilled personnel will be needed in the fields of system integration, maintenance, repair, recycling and R&D (PV Employment, 2011).

8.1.3 Political conditions

The political conditions represent forces concerning the political impact on PV and the FiT's. In this subchapter only the force "siting and construction" is analysed.

This force was taken into account as restrictions on ***siting and construction*** such as "height, aesthetic, noise or safety" *(*Mendonca, 2007 P.5) concerning the application of the building integrated PV (BIPV) can influence the success of the FiT as well.

The impact on restraining change is rather small when looking at the interview results. A comment taken from the interviews states that siting and construction restrictions will not be applied to friends or relatives that easily (Online survey, April 2011).

In Malaysia a Greenbuilding index tool has been introduced to promote sustainability and raise awareness among Developers, Architects, Engineers, Planners, Designers, Contractors and the Public about environmental issues (Greenbuildingindex Sdn Bhd, 2011). For the

construction sector in Malaysia the Master Builders Association Malaysia (MBAM) is devoted to further promoting and developing the construction industry (Malaysia Master Builders Association Malaysia, 2008).

8.1.4 Technical conditions

Technical conditions represent forces with regard to possible technical limitations which might hinder the success of the FiT system.

8.1.4.1 Access to the grid

One technical factor identified is ***access to the grid***. It is assumed if many people in Malaysia would have had no access to the grid they may increase the level of generated PV energy with off-grid systems, but they will not increase the success of the FiT which only applies for grid-systems.

The results of the internet survey suggest that access to the grid represents only low restraining force on the success of the FiT implementation in Malaysia.

The World Bank defines the electrification rate as the percentage of households with an electricity connection. This rate is th used as a key performance indicator (KPI) to check how the situation for grid access looks like in Malaysia (World Bank Group, 2011). While Peninsular Malaysia even including the rural areas has a rate of almost 100%, the two states on Borneo have had a rate of 82.6% in 2006. In whole Malaysia the electrification rate is about 98% (bfai, 2007). From this status it can also be stated that it is favourable to apply rooftop building integrated in commercial areas of the city which pose an alternative to upgrading the existing capacity. For rural areas [as in Sabah and Sarawak] stand alone systems with storage capacity are cheaper than grid extensions for small loads beyond a certain distance from the grid (Mohamad & Pasupuleti & Shamsuddin, 2009).

8.1.4.2 Grid structure

In addition to that the ***grid structure*** might have an impact as well which can generally be distinguished into radial-, loop- and mesh- grid structure, differing in their complexity and elaborateness (Coster, 2010, p. 14).

When looking at the interviews the result for this force is that it is restraining the success for the FiT in Malaysia to a medium degree.

The situation identified differs slightly from the interview results. The grid structure can be separated into radial-, loop- and mesh-structures, which has however no influence on the FiT tariff. The KPIs used to measure the grid structure are service reliability and distribution loss. The service reliability is the amount of time a customer does not have access to electricity per year measured in minutes. For Malaysia this amounts to 65.02 minutes in average, (Tenaga Nasional, 2010, p. 105) which is similar to countries such as Italy and France in Europe which have had amounts of 51 and 66 minutes, in 2009, respectively. For the distribution loss, defined as loss of electrical energy due to transportation measured in percentage, Malaysia has a rate of 8.45% in 2010 (Tenaga Nasional, 2010, p. 105). This is comparable to European countries such as France and Austria which have both had a rate of 7.8% in 2003 (Office of

Gas and Electricity Markets, 2003, p. 12). Thus, it can be said that the situation for the grid structure in Malaysia is not perfect but comparable with European countries.

8.1.4.3 Infrastructure

The third and merely summarising force is the Malaysian communication and transport ***infrastructure*** *(*Mendonca, 2007 p. XIV). It is assumed that the rate of transport infrastructure development is directly proportional to the efficiency of the FiT system's implementation around Malaysia.

From the interview results it can be concluded that the transportation infrastructure situation in Malaysia has a small restraining effect on the success of the FiT implementation.

Malaysia is served by a good network of primary and secondary roads with a small amount of 580 kilometres of superior quality expressways connecting Kuala Lumpur (KL) with Singapore (Advameg, Inc., 2011). While the railway situation in Malaysia is not good, ranking 75th worldwide, the country has specialised in shipping traffic as Malaysia has a coastline of 4,675 km (Central Intelligence Agency, 2011). Overall, it can be said that the infrastructure situation is not bad for a country in transition although a siginificant gap between East and West Malaysia is can be observed.

8.1.5 Cognitive conditions

Cognitive conditions represent forces which concern the public awareness of the FiT system.

Environmental awareness was identified as it pushes the renewable energy market in Europe. Dutch households for example had already made an active decision for green electricity by January 2003 (Bechberger & Reiche, 2004).

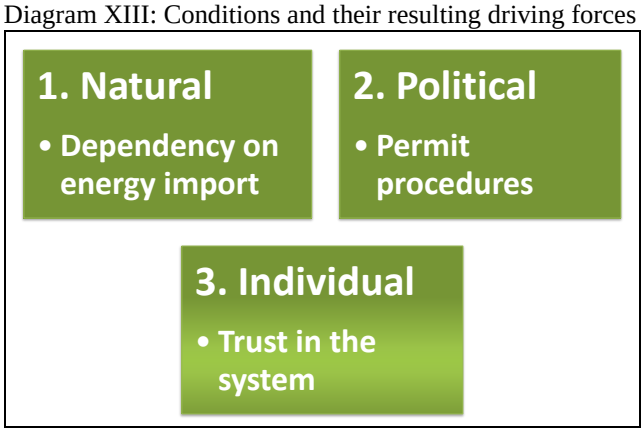
From the interview results it can be seen that environmental awareness has the smallest restraining impact on the success of the FiT implementation in Malaysia. For the interview participants the environmental awareness is weak as education on this topic is weak as well. In Europe it is assumed in one study that an absence of adequate education and public information efforts were responsible for a low environmental awareness (Bechberger & Reiche, 2004). In addition one interview comment states that real environmental awareness is only a characteristic of a small part of the population. The majority of the population only supports the environment and lives to its principles as long it does not result in any financial obligation (Online survey, April 2011).

A study which was conducted in 2009 found out that 83.8% of the urban Malaysian people have "agreed that environmental problems can be reduced by using renewable energy" (Haw, 2009: p. 596). By looking at the amount of environmental groups in Malaysia it can be stated that only international organizations are active and no national private organization. This is different in Canada and UK for example, where more than 20 and 30 national environmental organizations are active, respectively (see Wikipedia's list of environmental organisations, available from: <http://en.wikipedia.org/wiki/List_of_environmental_organizations>).

8.2 Driving forces

To have a recent overview of the forces which are determined to be driving, an overview is presented. The forces are presented in form of the framework conditions they correspond to, which have been examined in chapter 7.3. Each force is being analysed within their framework condition.

Diagram XIII: Conditions and their resulting driving forces



Source: Own illustration

8.2.1 Natural conditions

The ***dependency on energy*** imports, clustered as a natural condition, was taken into account as it is assumed that states and individuals tend to strive for independence.

From the interviews it can be seen that the dependency on energy imports has a small driving force on the success of the FiT implementation. From the comments it can be concluded that many interviewees were not knowledgeable about Malaysia's energy import situation. Therefore the situation has been analysed a bit deeper in the following paragraph (Online survey, April 2011).

In Malaysia's case the high amount of available oil and gas reserves have caused the country to be very independent on energy imports for a long time. But since also these fuels forms are finite and especially are becoming more difficult to tap, the share of coal in Malaysia's energy mix has increased to 40% at the moment as examined in chapter 4.1. Coal is the only considerable energy form related to the dependency on energy imports as natural gas is not imported at all (Central Intelligence Agency, 2011). The coal consumption in Malaysia for power stations has increased from 1,495 MW in 2000 to 5,541 MW in 2005 and it is still expected to grow (Gazhali, 2007: pp. 8,+)). The amount of imported coal from China, Australia (13%), Indonesia (72%) and South Africa (12%) to make this happen according to Asia Pacific Energy Research Centre, 2010, p. 96)) has increased from 9.5 Mt in 2009 to 19.9 Mt in 2010 ((Hellenic Shipping News, 2011)

8.2.2 Political conditions

The ***procedure*** of applying for a FiT ***permit*** is examined to have a potential impact on the FiT implementation due to their degree of complexity. The permit procedure overseen by the Governmental authority SEDA is classified as a political condition.

The interview results point out that the impact of permit procedures on the success of the FiT implementation can be considered positive but small. There were no comments submitted for this force.

In Malaysia the permit procedure involves the distribution Licensee (DL) and the Feed-in Approval Holder (FIAH). In Malaysia's case the DL will be one of the three energy supply companies and the FIAH will be the industrial, commercial or individual electricity generator. The DL will be registered by SEDA, overlooking and controlling the FiT procedure. In the updated Renewable Energy Bill 2010 an eligible producer may apply by submitting a "written application to the Authority" which may be furnished "by an electronic medium" and wish should contain "conditions and specifications [...] determined by the Authority (S.10): Applications may also be filled in online. If successful a Renewable Energy Power Purchase Agreement (REPPA) will be signed by both parties. From the situation it is obvious that all the information provided up to this point is too general for a system which should successfully be implemented in the third quarter of 2011. It is understandable, however that the permit procedure does not require many entities and it is praiseworthy that an independent authority (SEDA) has been founded to overlook and administer the permit procedure.

8.2.3 Individual conditions

Trust in the FiT is classified as an individual condition and was taken into account as it is assumed that a high conviction and acceptance for this system might drive its success.

From the interview results ***the trust in the FiT system*** is driving the success to a very little degree. The situation from personal interviews reflected a similar attitude. Many people believe that Malaysia as a developing country is not capable of implementing this system successfully.

As a study concluded in 2009 (Haw, 2009: p. 603), only 11 percent of the interviewees have heard of PV. Far-spread Promotion is important as 82% have not heard of any government incentives for using BIPV system or renewable energy (Haw, 2009, p. 603)

For both the 9 restraining forces as well as the examined three driving forces it can be concluded that all have been rightly identified to have an impact on the success of the FiT implementation in Malaysia. Therefore a consecutive chapter dealing with conclusions and recommendations will determine to which degree these analysed forces can be improved to consecutively increase the success of the FiT implementation in Malaysia.

9. Conclusions & Recommendations:

In this chapter the main research results of the report will be concluded first, before giving recommendations in form of an action plan in the following sub chapter.

9.1 Conclusions

The Malaysian government, in particular the national project leader for the Malaysian Building Integrated Photovoltaic (MBIPV) is identified as the most relevant addressee for this report, dealing with the main research question of whether the FiT system in Malaysia is a turnkey solution to increase the amount of generated grid-connected PV energy or if subliminal forces have a restraining or driving effect on the success of the implementation.

The share of grid-connected generated renewable energies in Malaysia contributes 0.5% to the country's generation mix, which is dominated gas and oil with shares of 52% and 40%, respectively at the moment. PV, which is the least relevant energy form of RE as of end 2008, is examined to increase by a rate of 3079% by the year 2040, making it the most prosperous RE form in Malaysia's future far ahead of mini-hydro, biomass, biogas and solid waste.

Despite usage of PV in Malaysia being prosperous, its pros exceeding its cons, and it having been promoted by policy and several specific programmes since 2001, the share of grid-connected generated PV in Malaysia as of July 2009 sums up to a marginal 0.0000416%. This share should dramatically increase by introducing the FiT in the third quarter of 2011 embedded in a new national RE policy and action plan.

Looking at the FiT success around the world Malaysia's intention to increase the amount of grid connected PV from 7MW at the end of 2011 to 55-65MW in 2015 is ambitious but historically achievable considering other countries which have implemented the system. Yet, as the degree of success varies widely around the world it is assumed that there are forces driving and restraining the success of the FiT implementation in Malaysia.

23 forces, which are clustered into the fields of natural, market, political, individual, technical and cognitive conditions are identified to have a varying impact on the success of the FiT implementation in Malaysia based on an executed online survey filled out by 23 photovoltaic industry experts. 9 out of the 23 forces are maintaining the status quo and the remaining 14 are driving the success of the FiT implementation in Malaysia. Weakening all the forces which are restraining the success of the FiT implementation one by one will increase the degree of positive change. Increasing the impact of the three smallest driving forces represent a safety mechanism, as it cannot be assumed that it is worthwhile and doable to decrease all the restraining forces completely. The three lowest driving forces are taken as they yield the biggest room for improvement.

The analysis of each force based on their origin, the interview results, comments of respondents and the situation in Malaysia proves the first part of the main research question wrong whether the FiT in Malaysia is a turnkey solution, as there are clear indications that forces are restraining or driving the success of the FiT implementation in Malaysia. This awareness forms the basis for the upcoming recommendations which intend to improve the situation of each force leading to a more successful FiT implementation in Malaysia.

9.2 Recommendations

The recommendations of this chapter are based on the conclusions drawn in sub chapter 9.1 and the extensive analysis results of the 12 forces presented in chapter 8. The drawn recommendations are summarized and presented in form of an action plan at the end of this chapter.

Subsidies on fossil fuels should be consequently phased out step by step in order to create fair market conditions and to give renewable energy a chance in Malaysia. It is important to not radically cut all of the subsidies at once which the Malaysian middle class would not be able to cope with due to massively rising, fuel and electricity prices. Nevertheless a reduction has to occur as it minimizes an overutilization of these resources. Subsidies for coal should be cut first as it is mainly used for generating energy and it represents the only energy form which is imported to a high degree. By decreasing the artificial advantage of cheap coal the FiT would be more successful, consecutively increasing the amount of generated PV in Malaysia. The FiT is falsely branded as a government subsidy as well, but is in fact paid by the Malaysian community through their electricity bills.
The result of this recommendation will be a decreasing restraining force blocking the FiT success and additionally a financial surplus which could be used to finance R&D projects or promote awareness for green technologies in Malaysia.

The ***attitude of utility companies*** is examined to be unfavourable, as their margins for generating and distributing fossil fuels are higher. This aspect should not be neglected by the Malaysian government, which could pay an interim compensation to the three largest utility companies. If this compensation payment resulted in a slightly higher profit margin for distributing RE than for conventional fossil fuels, this restraining force might even convert to drive the success of PV in Malaysia. This compensation is no final solution and to be defined as interim, since the declining prices for PV due to technology advancement and economies of scale as well as the rising costs for the generation of energy through decreasing fossil fuels is bound to break even in future. Due to these developments the compensation, which could be used from the financial surplus in subsidy cuts, would have to be adapted on a fixed time basis.
Motivating the utility companies through a financial incentive could not only lead to a complete reduction, but depending on the size of the payment it could also lead to a positive impact on the success of the FiT in Malaysia.

Access to credit has to be simplified, promoted and made available by the Government as a PV implementation is bound to high investment costs. An average RM 17,000 for a capacity of 1.0KWp makes it necessary for a majority of the Malaysian individuals to obtain a form of loan. The Government could ask the local banks to promote a special loan which is tailored to the needs of this special RE investment. As another alternative the SEDA authority managing the FiT process could be equipped with a fund which could serve as a source of loans. By decreasing the interest rate for this special loan the FiT system could be promoted even stronger as the investment might be more beneficial than buying a second real estate for example. With an own loan source at hand for the PV and RE investments the Government would remain in control of providing a simplified, ready to access credit to individuals. Moreover SEDA would strategically diversify their service portfolio.
The result of the recommendations could not only lead to a reduction of the restraining forces, but could also become a driving force as the bureaucratic workload decreases for individuals if they have an organization providing them with a one-stop service.

Skilled personnel is available for the manufacturing and production of PV modules but is scarce at the moment when it comes to system integration and service. The market forces of supply and demand are going to fill the shortage of skilled labor force at the moment as far as it is beneficial for companies to come to Malaysia. The Government can therefore either promote the opportunities by searching for foreign direct investments (FDI) or by growing their own industry. In cooperation with the public universities the ministry of education can initiate courses based on system integration, service and maintenance of RE facilities. In this way maybe also a few local companies might be able to establish themselves and compete with foreign companies in the Malaysian market when PV is anticipated to encounter a boom after the year 2020.
The short term skilled personnel shortage can be covered by foreign companies lured into Malaysia by presenting the tremendous growth rates for this industry. This will decrease the impact of that particular restraining force. By starting now to promote relevant study courses, the government will be able to take advantage of the industry's growth in the long run.

Siting and construction limitations and restrictions are assumed to be low in Malaysia. SEDA has to make sure that there is sufficient and straight-forward information available in their documents and on their homepage in order to not confuse the individuals which are applying for the FiT. It is not avisable to burden the individuals with things like height or aestethic restrictions, as the success of the FiT system and the increase in clean energy should prevail over such concerns. The greenbuilding index tool which is tailored to improve energy efficiency at the moment can be expanded by a function to include and calculate savings when implementing the FiT and inform about potential siting and construction regulations as well.
If the potential siting and construction limitations are clearly communicated by SEDA, that small restraining force will decrease. In addition, a promotion and expansion of the greenbuilding index tool can help to increase the success of the FiT implementation.

Observations on ***Grid access, grid structure and infrastructure*** all suggest that the situation in Malaysia is not perfect, yet comparable to Southern European countries such as France, Italy or Spain. It is a fair assumption to predict that the FiT success will grow if the huge gap between peninsular Malaysia and Borneo is bridged since this would make an entire new market available. In Borneo, it makes sense at first to promote subsidised off-grid technology which would on the one hand decrease the low electricity supply rate and would on the other hand increase PV production. This has a positive impact on the Malaysian economy leading to lower prices for PV modules based on the economies of scale. Additionally the off grid systems could easily be converted to grid solutions as soon as it is economically feasible. Concerning grid structure, TNB is on a good way to eliminate the deficits which distinguish Malaysia from a developed country and no further action has to be taken here.

A lack of ***environmental awareness*** results from an absence of adequate education and public information. The Malaysian public has to be informed timely via effective channels such as television, newspapers and internet services in order to demonstrate what the consequences of CO^2 mitigation look like and which worst case scenarios could be prevented. It will be realized that clean energy forms are worth promoting as they preserve the environment. Especially on Borneo this will be a decisive factor due to the increasing amount of energy demand. Creating a political environment group engaged in the preservation of nature and promoting RE would maybe trigger the start of Malaysian non-governmental organizations (NGO's) which are not existent at the moment.
With the recommendations of presenting worst-case scenarios and showing initiative through the creation of a political environmental group, the remaining restraining force can be tackled.

Dependency on energy imports is in contrast to other forces not changeable for Malaysia and fortunately not required as it is driving the success of the FiT at the moment. It is stated that a dependency on energy imports is good for the success of the FiT, as RES present an alternative to lower the dependence. If the driving force would want to be increased the easiest way would be to increase the amount of imported energy. This, however, would have a direct negative impact on RE including PV, as coal is primarily used for the generation of energy in Malaysia.
From the results it can be concluded that it is best to leave this factor untouched or even risk that the driving force may decrease due to subsidy cuts mentioned in the first force.

Permit procedures in Malaysia are considered as driving the success of the FiT implementation in Malaysia as there are not many entities and documents required to apply for the system which is overseen and administered by SEDA. What can still be improved is that the support shall be made available and the permit procedure should be explained before the FiT is introduced. Namely the internet homepage should be set up as soon as possible which is currently redirecting people to the homepage of the MBIPV which is only responsible for the promotion of PV and not for the FiT. Furthermore it does not have a professional look-and-feel as many pieces of information regarding the procedures are scattered on the World Wide Web. A binding procedure should be able to be looked up on the SEDA homepage. Furthermore a telephone hotline could be installed right away which would answer individual "tricky" questions and provide interested parties with a contact person.
Expanding the simplified permit procedure by providing additional service and support facilities for interested parties will increase the amount of driving force.

Trust in the [FiT] system is a very small driving force at the moment as it is believed that Malaysia as a developing country is not capable of implementing the system very successfully. To enhance trust, the studies in this report examining the success in other high riser countries such as Germany, China and South Korea can be brought forward. Going hand in hand with the promotion efforts of environmental awareness is the knowledge barrier which has to be bridged. When people are more knowledgeable about the advantages of the FiT system and its component PV the trust in the system will increase. After the FiT implementation the MBIPV can focus on building trust in PV, as neither the energy form nor Government organizations which are promoting it are known to more than 15% of the population. SEDA on the other hand can increase the trust in the system by coordinating the FiT and supporting interested parties in a professional way.
In general, trust in the FiT system will increase automatically by implementing the recommendations corresponding to the other forces mentioned above.

The action plan below gives an overview of all the force names, types, recommendations per force, responsible organizations and a time indication to see at one glance what should be improved in order to achieve a high success for the FiT in Malaysia. After the consequent implementation of the recommendations, there will be a full driving force pushing the success of the FiT in Malaysia.

Table VI: Action plan

Name of force	Impact according to interview	Action	Organization in charge	Time	Expected result
Subsidies on fossil fuels	High restraining force	- Phase out strategy - Cut subsidies on coal	PM Department	Ongoing A.s.a.p.	Low restraining + financial surplus
Attitude of utility companies	High restraining force	- Pay interim compensation	PM and Financial Department	When FiT is implemented	Low driving force
Grid structure	Medium restraining force	- Will change to no low restraining and afterwards to no impact without action			Low restraining
Access to credit	Medium restraining force	- Ask local banks to promote tailored loans for FiT - Create fund as loan source for FiT	KeTTHA SEDA	Before introduction of FiT	Low driving force
Skilled personnel	Low restraining force	- Fill shortage with foreign companies - Build up own industry	MIDA MOE	A.s.a.p. Ongoing	No impact
Siting and construction	Low restraining force	- Define and present information on homepage - Expand green building tool	SEDA	A.s.a.p. A.s.a.p.	No impact
Grid access	Low restraining force	- Promote subsidised off-grid technology in very rural areas on Borneo	Ministry of National and Rural Development and KeTTHA	After research has been carried out	No impact
Infrastructure	Low restraining force	- Close gap between Peninsular Malaysia and Borneo by improving roads, railways and shipping traffic	Ministry of National and Rural Development	Ongoing	No impact
Environmental awareness	Low restraining force	- Present worst case scenarios - Found political environment group	KeTTHA PM Department	A.s.a.p 01/2012	No impact
Dependency on energy imports	Low driving force	- None	KeTTHA	n/a	Low driving force
Permit procedures	Low driving force	- Improve support services	SEDA	A.s.a.p.	Medium driving force
Trust in the system	Low driving force	- Show FiT success around the world - Implement all actions above	KeTTHA See above	A.s.a.p See above	Medium driving force

Source: Own illustration

10.Critical appraisal

This final chapter will evaluate the content based limitations and will identify to which extent the research results are reliable and representative. Additional task and further draft solutions will round off this chapter.

It has to be stated that a majority of research findings describing the situation for PV and FiT in Malaysia was restricted to documents created by the Malaysian Government representing a biased point of view. This argument holds for newspaper articles which were used to describe the actual situation in Malaysia as well. As there is a lot of change going on concerning the FiT system especially the numerical data is due to be changed or updated in a short period of time.

Concerning theoretical research mainly books from the Malaysian National Library have been used. By expanding the research to other libraries in Europe the availability and quality of sources may be expanded.

Regarding the main force field analysis a number of restraints and limitations have become apparent as well. The amount and types of forces, taken from various sources, make no claim to be exhaustive. There might be many other forces which will have a bigger, smaller or no impact on the system which have not been concluded in this report. The forces are judged to potentially influence the success of the FiT system which was checked by executing the online interviews.

The interviews as such are statistically not representative as the received number of questionnaires (23) is too low considering the amount of people which have a relationship to PV in Malaysia. The research can give a statistical indication, but does not represent an empirical study. Moreover the exact sample size of this survey cannot be calculated and is not traceable as contact persons have forwarded the link leading to the questionnaires, within their networks. In addition the results of the survey are questionable at a few stages, as it appears that some respondents have not fully understood the way the questionnaire should have been filled out.

In order to overcome the problem of questionable survey results, an additional research has been carried out which compared the survey results to the Malaysian situation. In all of the cases the situation in Malaysia reflected a very similar situation compared to the results of the interviews.

Another perhaps feasible solution which has not been considered in this report is the fact that many foreign companies are producing the solar modules in Malaysia. This saves transportation costs and gives a guarantee that the price reduction of solar panels, due to technical development, is passed on straight away.

Summarized from the report it can be stated that the most decisive factor for improving the success of the FiT in the long run is a committed and promoting RE policy of the Malaysian Government.

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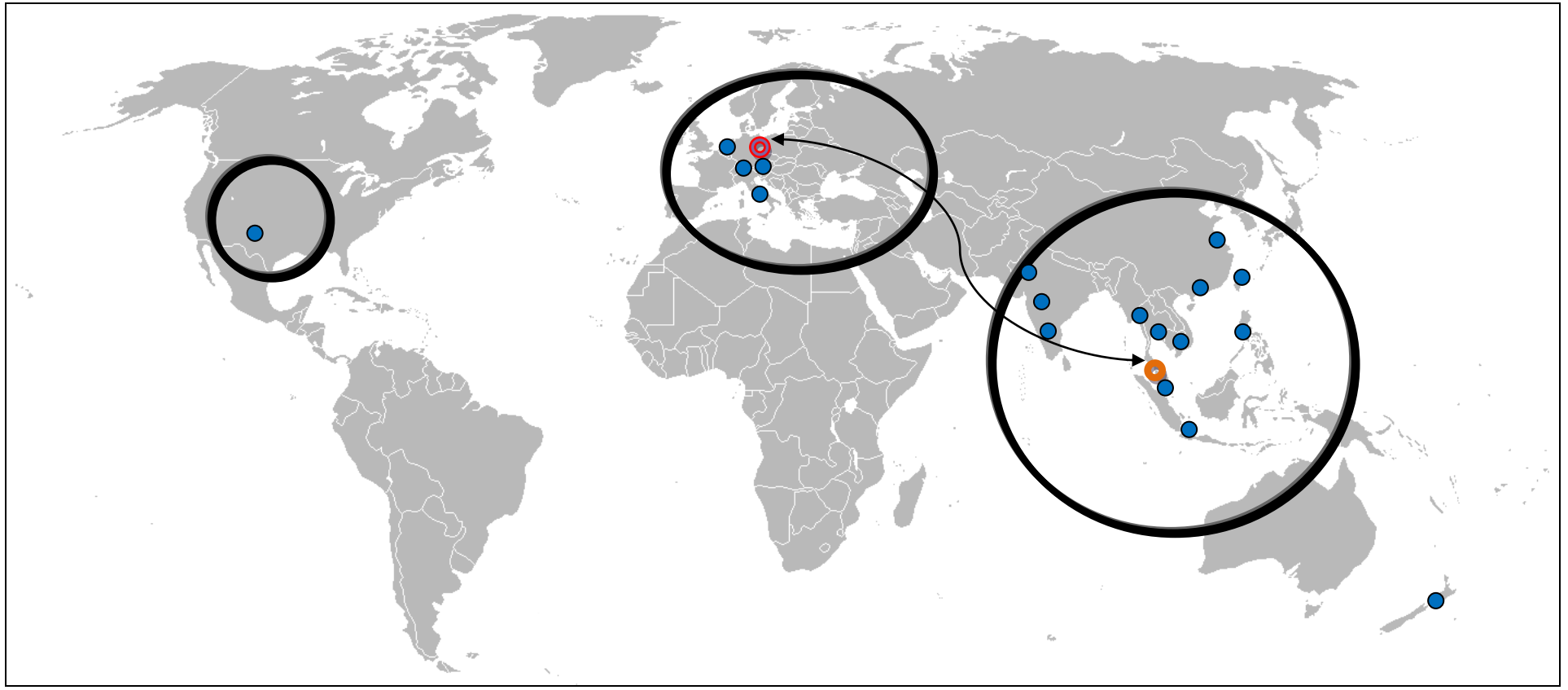
List of abbreviation

ALA	Advanced learning arrangement
BIPV	Building integrated photovoltaic
BN	Barisan Nasional
CDM	Clean development mechanism
CEO	Chief executive officer
CSP	Concentrated solar power
Ccm	Cubic meter
DL	Distribution licensee
EE	Energy efficiency
FDI	Foreign direct investments
FIAH	Feed-in approval holder
FIHE	Fontys Internationale Hogeschool of Economie
FiT	Feed-in-tariff
GHG	Greenhouse gases
IBMS	International Business and Management Studies
IPP	International power producer
KL	Kuala Lumpur
KPI	Key performance indicator
KPKT	Kementerian Perumahan dan Kerajaan Tempatan
KTTHA	Kementerian Tenaga, Teknologi Hijau dan Air
MBAM	Master Builders Association Malaysia
MBIPV	Malaysian building integrated photovoltaic
MIDA	Malaysian Industrial Development Authority
MOE	Ministry of Education

MPIA	Malaysian Photovoltaic Industry Association's
NGO	Non-governmental organization
PM	Prime Minister
PV	Photovoltaic
R&D	Research & development
RE	Renewable energies
REFITs	Renewable energy feed-in tariffs
REPPA	Renewable energy power purchase agreement
RES	Renewable energy sources
RM	Malaysian ringgit
SEDA	Sustainable Energy Development Authority
SREP	Small renewable energy program
SUPP	Sarawak United Peoples' Party
TNB	Tenaga Nasional Berhad

List of appendices

Appendix 3: GBP's network



Legend:

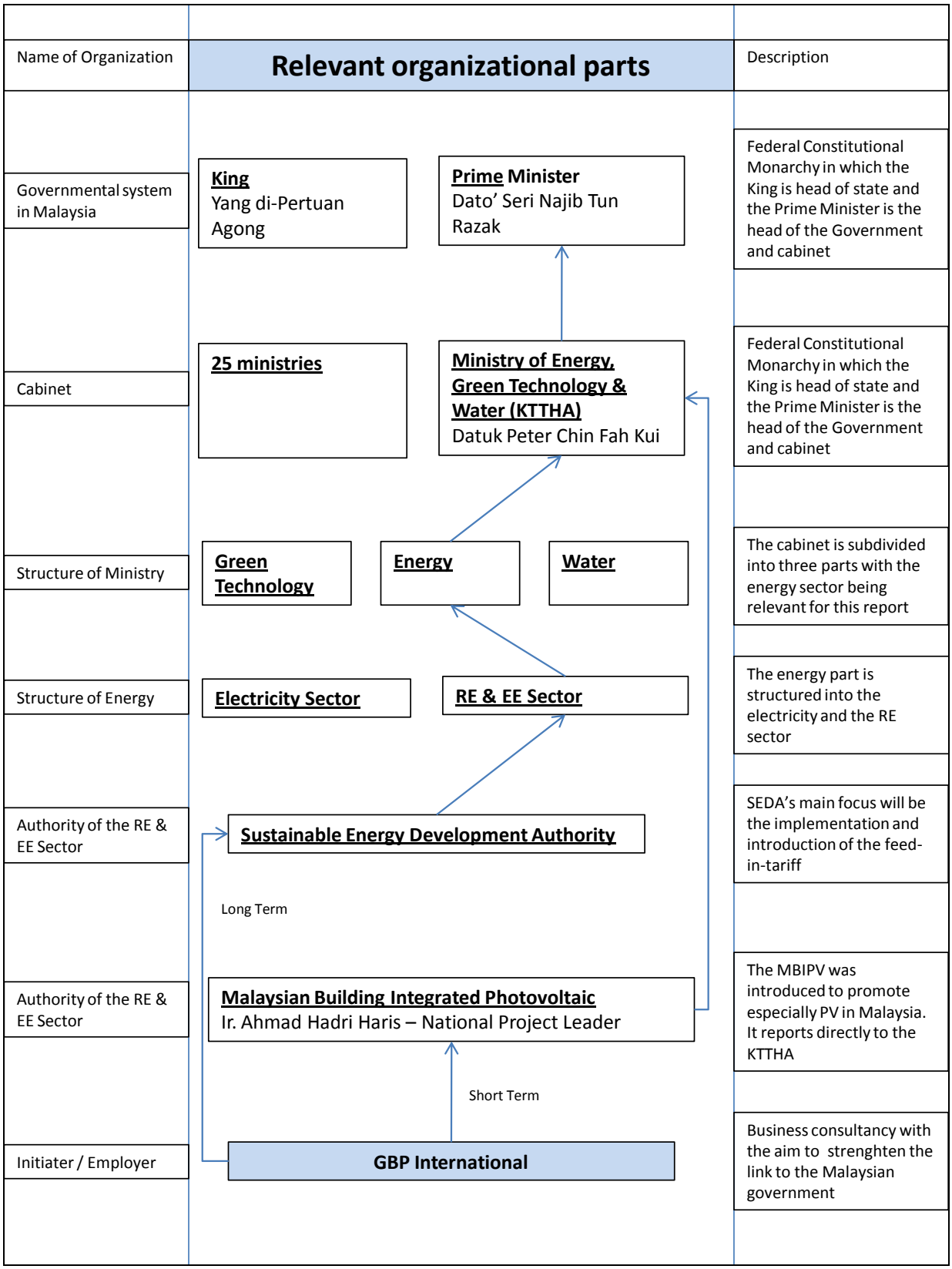
Regional focus

Company's strategic HQ

Company's operational HQ

Company Representative

Appendix 4: Involved parties and their relationships

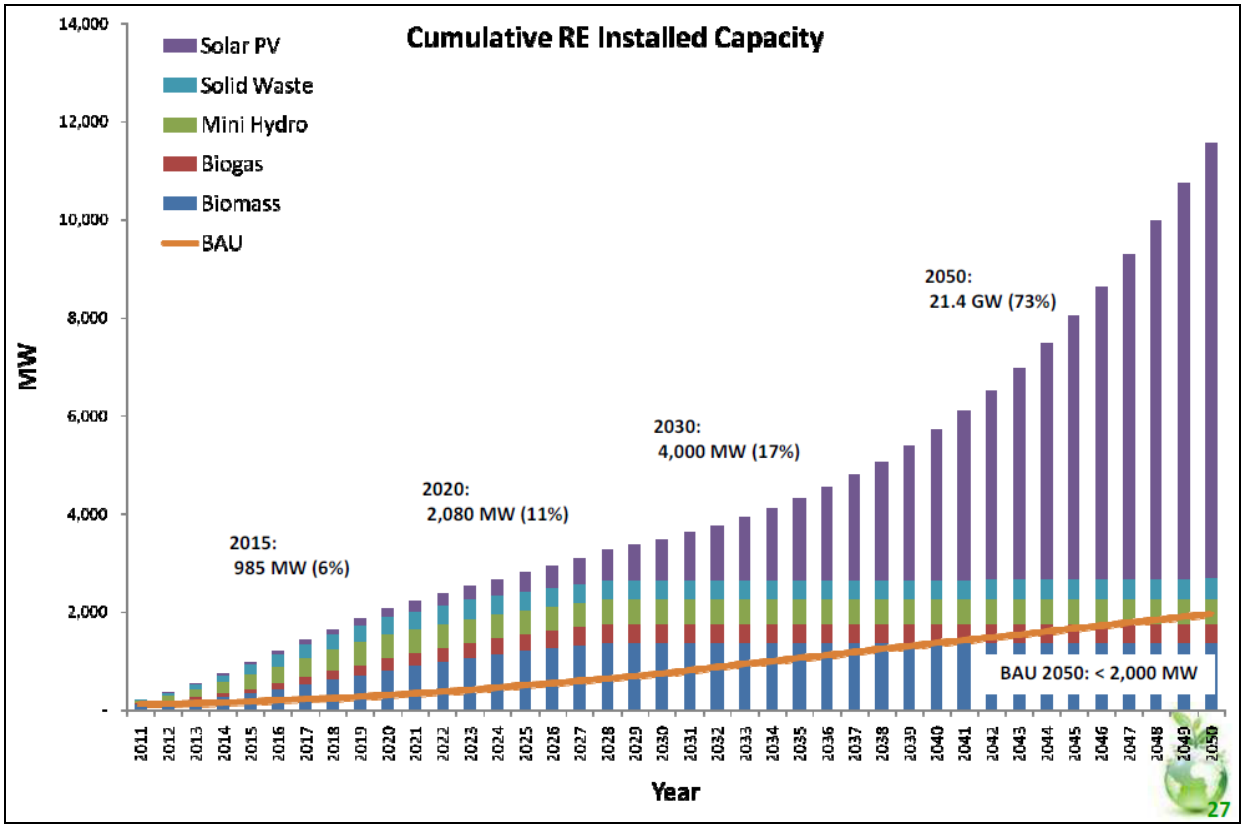


Appendix 5: Planned MW per renewable energy form

RE Policy: Projected RE Growth

KeTTHA KEMENTERIAN TENAGA, TEKNOLOGI HIJAU DAN AIR

Year	Cum Biomass (MW)	Cum Biogas (MW)	Cum Mini-Hydro (MW)	Cum Solar PV (MW)	Cum SW (MW)	Cum Total RE, Grid-Connected (MW)
2011	110	20	60	7	20	217
2012	150	35	110	15	50	360
2015	330	100	290	55	200	975
2020	800	240	490	175	360	2,065
2025	1,190	350	490	399	380	2,809
2030	1,340	410	490	854	390	3,484
2035	1,340	410	490	1,677	400	4,317
2040	1,340	410	490	3,079	410	5,729
2045	1,340	410	490	5,374	420	8,034
2050	1,340	410	490	8,874	430	11,544



Appendix 6: Technical functioning of the PV system

The solar spectrum is a distribution of wavelengths from the ultraviolet to the infrared characterized by an average solar surface temperature of approximately 6000°K. In the ultraviolet and visible parts o the spectrum, the light quanta have sufficiently high energy to induce chemical transitions in absorbing materials. This is the basis for solar photochemical processes and photovoltaic conversion to electricity

In 1980 photovoltaic conversion uses solid-state semiconductor crystals that are dropped with positive and negative atoms to produce an electric field across the crystals. When sunlight passes through such a crystal, some of the light is absorbed by atomic electrons, which become excited up to conduction levels. The electric field drives the electrons through the cell and the outer circuit, producing a flow of electrical power. (Donald Rapp (23.04.1980) Solar Energy, 1981 by Prentice Hall, Inc., Englewood Cliffs, N.J. 07632)

Photovoltaic Energy - Technology and Applications:

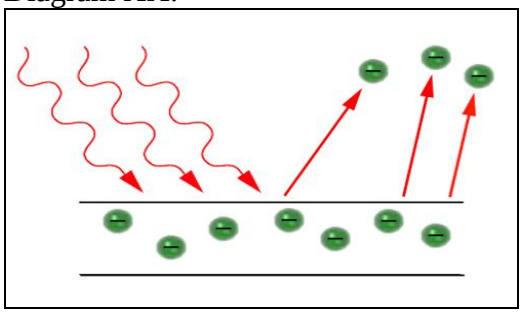
Solar energy has many uses either it be used to provide heat, light or to generate electricity. In general, solar energy systems can be categorized as two types: ***passive*** solar energy which refers to the collection of heat and light and ***active*** solar energy refers to storing and converting this energy for other uses, as photovoltaic (PV) electricity or thermal energy. (Mohd Afzanizam Mohd Barin (12.11.2009),„**Solar Photovoltaic")**

Appendix 7: Product, value chain and application

The photovoltaic or photo electric effect

The solar spectrum is a distribution of wavelengths from the ultraviolet to the infrared [...]. In the ultraviolet and visible parts o the spectrum, the light quanta have sufficiently high energy to induce chemical transitions in absorbing materials. This is the basis for solar photochemical processes and photovoltaic conversion to electricity. (Donald Rapp (23.04.1980) Solar Energy, 1981 by Prentice Hall, Inc., Englewood Cliffs, N.J. 07632)

Diagram XX:



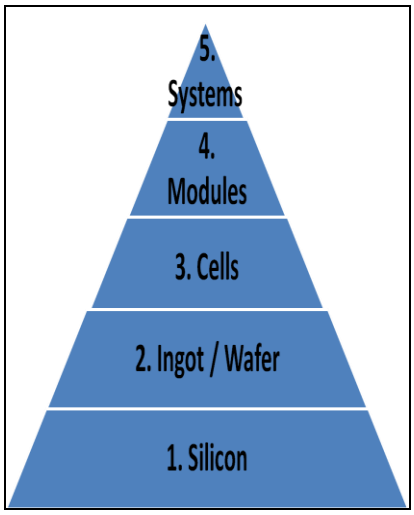
Until today conversion uses solid-state semiconductor crystals that are dropped with positive and negative atoms to produce an electric field across the crystals. When sunlight passes through such a crystal, some of the light is absorbed by atomic electrons, which become excited up to conduction levels.

Source: Own illustration based on: www.learner.org

Electrons emitted in this manner may be referred to as "photoelectrons", which was first observed by Heinrich Hertz in 1887. (Sears, Francis W., Mark W. Zemansky and Hugh D. Young (1983), *University Physics*, Sixth Edition, Addison-Wesley, pp. 843-4. ISBN 0-201-07195-9). The electric field drives the electrons through the cell and the outer circuit, producing a flow of electrical power. (Donald Rapp (23.04.1980) Solar Energy, 1981 by Prentice Hall, Inc., Englewood Cliffs, N.J. 07632)

The value chain

The photovoltaic value chain in Malaysia can be declared as identical to value chains around the world. For reasons of simplicity it can be separated into five distinct components displayed in form of a pyramid. The size of each block is not chosen randomly but it also presents the amount of technical know-how and the production scale at each stage.



1. At the start of the photovoltaic process, hence the bottom of the pyramid is the mining and processing of the solar grade silicon.
2. After the silicon has been mined, producers of ingot and wafers cut it into wafers, around 250 microns thick.
3. In the next step cell producers apply coatings and contact to the cell.
4. In the last but one step module manufactures assemble the individual cells into strings and laminate and frame the assembled cells.
5. System integrators and installers carry out design and install completed PV systems.

Application

Solar PV systems are usually incorporated into domestic, commercial or industrial buildings. Old buildings can be updated by retrofitting them into existing roofs, whereas for new buildings the solar PV system can be build in without requiring secondary roofs. This is called building integrated photovoltaic (BIPV) system which is more efficient, as the resources for the classic roof are saved. There are also ground mounted installation methods which are placed on plain fields in the environment potentially used for agricultural purposes before.

Every form of application can either come as an off-grid- or as an on-grid system. A off-grid solution generates electricity for local usage. If additional electricity is generated which cannot be used at the moment it is either wasted or it is stored in a large battery. On grid systems do not store electricity locally, but in contrast they feed the surplus back into the national grid which often takes the picture of a giant battery. The main advantage of on-grid systems is that less energy is converted into mainly useless heat and lowering the cost of the capital investment. (Solar Photovoltaic: Sunny solutions for tomorrow – Malaysia Energy Guide. The main advantage for off-grid solutions is that they can be applied in rural areas where it would not be economically sensible to establish a national grid.

Appendix 8: History and interesting facts to know about PV worldwide

Solar energy radiation is the only primary source directly exploitable at every place on Earth. It therefore offers everyone free access to energy and, moreover, to electricity, that most modern and multifaceted form of energy services. It bears by far the biggest potential - larger than that of all other renewable energy sources, larger than anything to which fossil fuels and nuclear power could ever aspire.
Feed in tariffs: accelerating the deployment of renewable energy – Google books).

In the beginning photovoltaic technology was used in simple consumable goods such as calculators or parking meters and hazard road signs in urban areas.

A study conducted in 1972 concerning the perspective and prospects of solar energy in developing countries came to the conclusion that in developed countries the utilization of photovoltaics is far too expensive for large-scale terrestrial use and it was only used for highly developed space-vehicle use. The potential contribution to energy economies of developing areas, other than for communication could not be foreseen with actual technological practices back then at all.

Today in the beginning of the 21st Century a lot has changed for the situation of photovoltaics and researcher are now sure that it will become the most efficient and the most common source of renewable energies in Malaysia in the future.

The cost of electricity from batch-produced cells was about 40 times that of electricity from conventional sources in 1975. (Donald Rapp (23.04.1980) Solar Energy, 1981 by Prentice Hall, Inc., Englewood Cliffs, N.J. 07632)

The solar power industry has been on a tear, growing at more than 30% per year for the last six years. It's poised to reach a surprising milestone within two years [2008], when it will gobble up more silicon for its electricity-generating panels than semiconductor makers use in all their [computer] chips and devices. (John Carey, (06.02.2006) "What's Raining in Solar's Parade?", Business Week p.78)

Applications and implementation

Solar cells are often electrically connected and encapsulated as a module. PV modules often have a sheet of glass on the front (sun up) side with a resin barrier behind, allowing light to pass while protecting the semiconductor wafers from the elements. Solar cells are also usually connected in series in modules, creating an additive voltage. Connecting cells in parallel will yield a higher amperage. Modules are then interconnected, in series or parallel, or both, to create an array with the desired peak DC voltage and amperage.

Appendix 9: Private companies engaged in PV in Malaysia

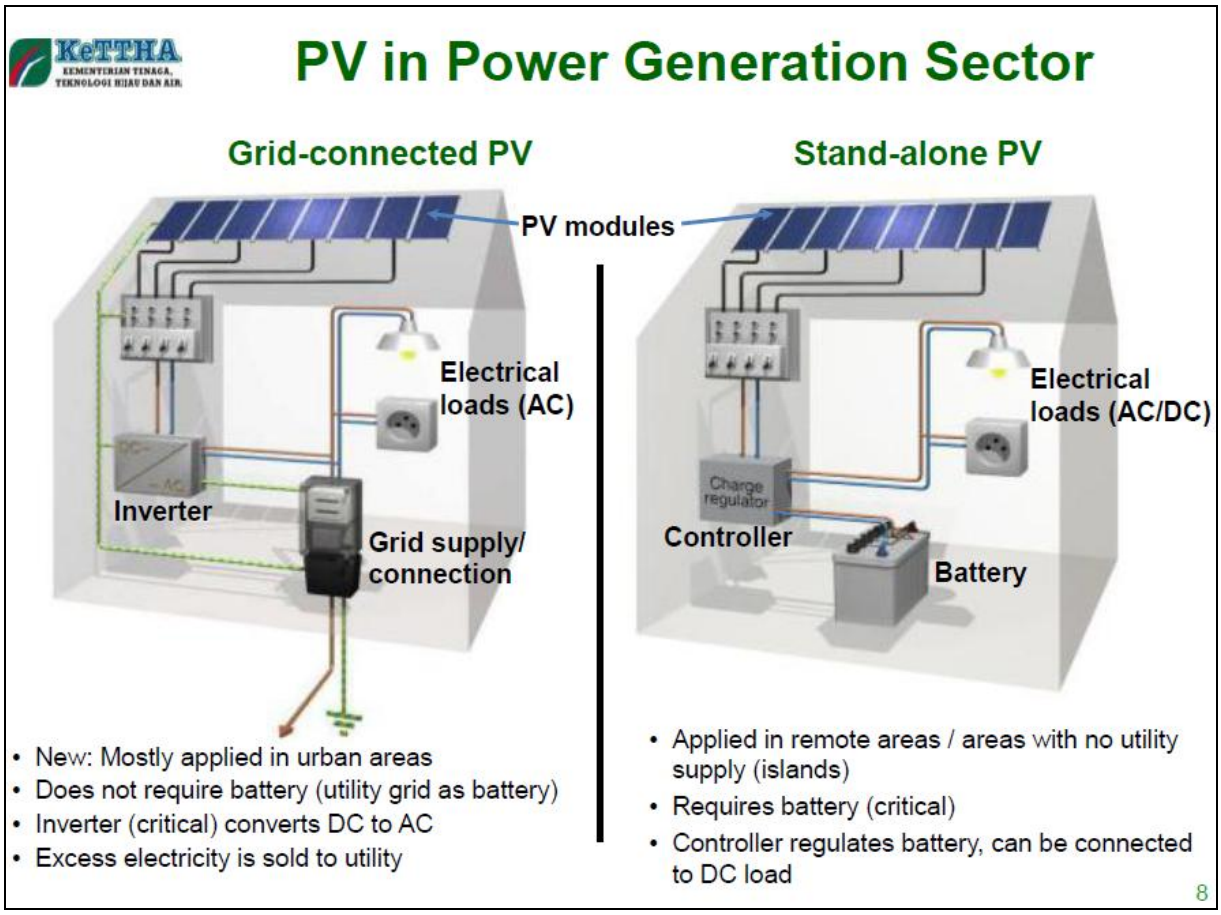
The fourth institution is represented by private companies manufacturing and trading along the photovoltaic value chain.

Especially the international modules and cell manufacturers are important drivers for the Malaysian economy. The three big companies “First Solar”, “Q-Cells” and “Sunpower” alone have created over 10.000 jobs. They have produced panels and cells with a peak capacity of over 2000 MW and have invested more than RM 10 billion in Malaysia.

Local companies engaged in the systems and support providing inspection machines such as TT Vision or manufacturing solar cables such as PIE Industrial belong to major players in the photovoltaic industry as well. (Pusat Tenaga Malaysia, “Facts and Figures on Photovoltaics” Slide 69)

Appendix 10: On-grid and off-grid systems

There are two different systems for photovoltaic worldwide which are also implemented in Malaysia. On the hand there are off-grid solutions for photovoltaic in Malaysia and on the other hand a smaller part is the grid connected photovoltaic systems.



Appendix 11: Solar radiation in Malaysia

The availability of solar energy in any location in the world can be studied by two methods. The first involves measurements from a radiation monitoring network and the second is based on the use of physical formulae and constants. (J.C. McVeigh (1983) "Sun Power – An introduction to the applications of solar energy, 2nd edition, British Library Cataloguing in Publication data)

On average Malaysia receives about 4.862 kwh/m² of solar radiation in a year. As it is equatorial, it receives a consistent amount of sunshine every day. (Solar Photovoltaic: Sunny solutions for tomorrow – Malaysia Energy Guide). The maximum solar radiation receive is 5.159 kWh/m² mostly in Northern region of Peninsular Malaysia The Southern and Northeast region of Peninsular Malaysia receives the lowest average solar radiation. (Thin Film PV Technology Round-Table Discussions, July 2008, Malaysia Energy Centre).

Appendix 12: Advantages and disadvantages of thin film and silicon wafer based systems

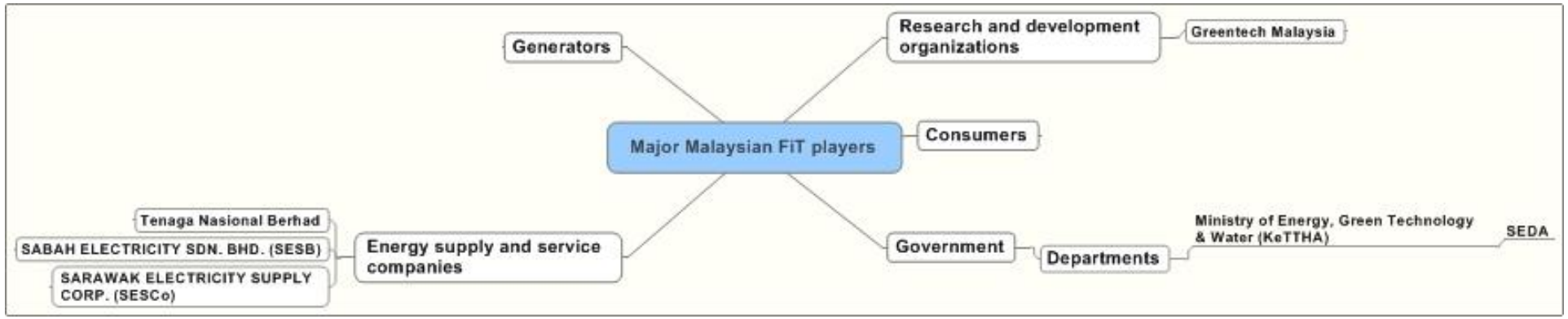
	Silicon Wafer Based	Thin films
Advantages	- Well proven - Higher efficiency - Market dominate - Higher current / lower voltage may result in simpler design	- Lower manufacturing cist - Can be lightweight and flexible substrate - Less silicon material - Faster manufacturing process - Higher energy performance
Challenges	- Thinner wafer and handling - Upscale and significant cost reductions	- TCO deposition on large area - Increase efficiency - Long-term stability to proof

Appendix 13: PV success around the world

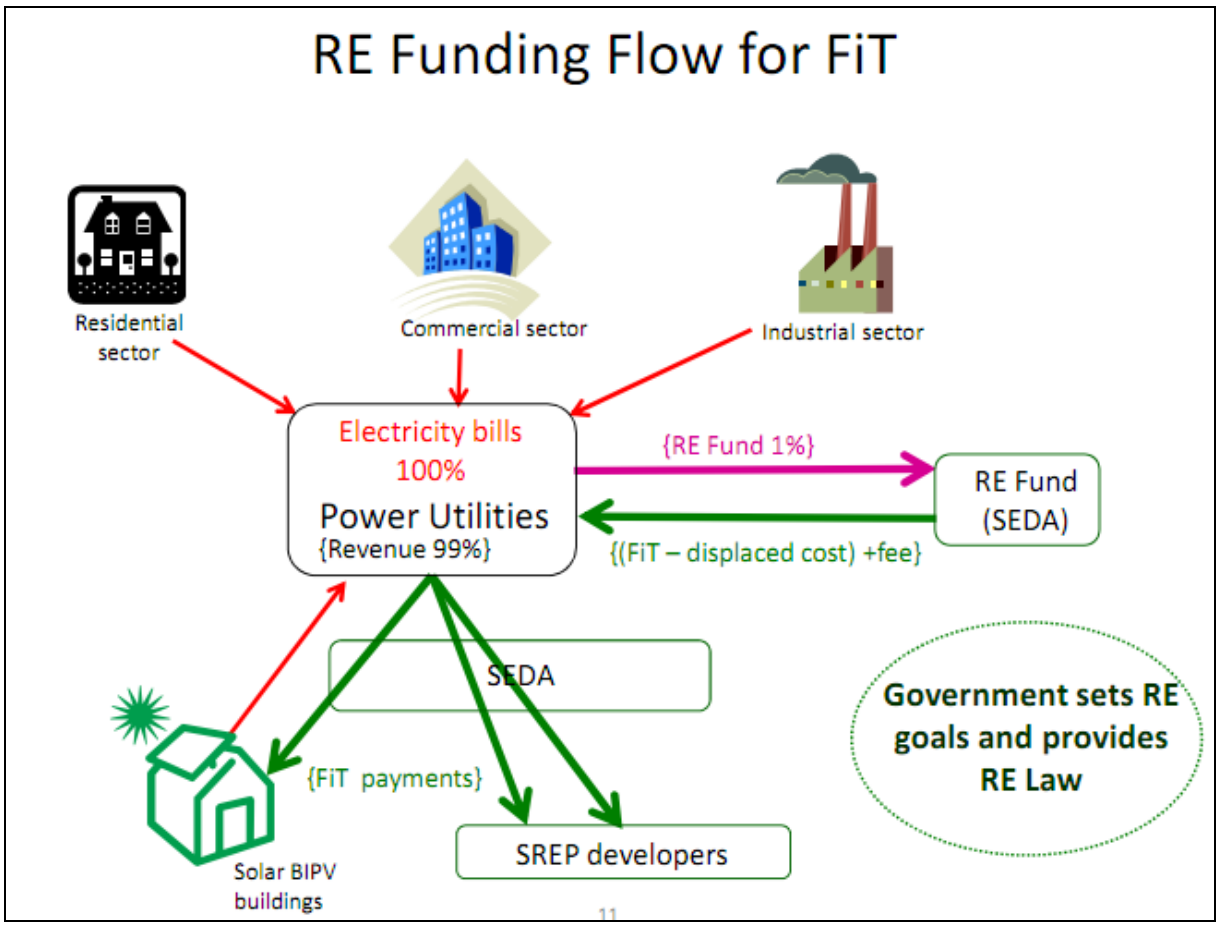
Year	Countries added that year	Amount of generated Renewable Energy at introduction of FiT	Amount of generated Renewable Energy after 4 years	Rate of increase
1978	United States			
1990	Germany	0,56	12,40	22,14
1991	Switzerland	4,70	7,50	1,60
1992	Italy	8,50	16,00	1,88
1993	Denmark	0,10	0,40	4,00
1993	India			
1994	Spain	5,70	8,70	1,53
1994	Greece			
1997	Sri Lanka			
1998	Sweden	0,80	1,90	2,38
1999	Portugal	0,90	2,10	2,33
1999	Norway	5,70	6,60	1,16
1999	Slovenia			
2001	France	13,90	33,00	2,37
2001	Latvia			
2002	Algeria			
2002	Austria	10,30	25,60	2,49
2002	Brazil			
2002	Czech Republic	0,00	1,00	N/A
2002	Indonesia			
2002	Lithuania			
2003	Cyprus			
2003	Estonia			
2003	Hungary			
2003	South Korea	6,00	77,60	12,93
2003	Slovak Republic			
2004	Israel	0,90	3,00	3,33
2004	Nicaragua			
2005	China	68,00	305,00	4,49
2005	Ecuador			
2005	Turkey	2,30	4,80	2,09
2005	Ireland			
2006	Argentinia			
2006	Pakistan			
2006	Thailand			
2007	Albania			
2007	Bulgaria			
2007	Croatia			
2007	Dominican Rep.			
2007	Finland	4,40	6,90	1,57

2007	Macedonia			
2007	Mongolia			
2007	Uganda			
2008	Kenya			
2008	The Philippines			
2008	Tanzania			
2008	Ukraine			
2009	New South Wales			
2009	Japan			
2009	Serbia			
2009	South Africa			
2009	Taiwan			
2010 (early)	United Kingdom			
	Total	132,76	512,50	3,86

Appendix 14: Relevant Malaysian FiT players



Appendix 15: RE funding flow for FiT



Appendix 16: Origin of framework conditions including forces

Natural conditions

Natural conditions contain potential forces dealing with photovoltaic as an energy form compared to fossil fuels.

The dependency on fossil fuels derived from the force "dependency on energy imports" (Bechberger, M. & Reiche, D., "The spread of renewable energy feed-in tariffs (REFITs) in the EU-25") was taken into consideration as it was evaluated that an increase in photovoltaic is directly responsible for the decrease of the other energy forms, assuming that the energy demand remains on an equal level.

Subsidies on fossil fuels are taken into account as they distort the success of the system according to their occurrence in many other countries. *(*Mendonza, M. (2007)"Feed in tariffs: accelerating the deployment of renewable energy", World future council, Earthscan, London P. XV)

Market conditions

Market conditions contain forces concerning the overall photovoltaic market situation.

Market stability could have an impact as "most individuals tend to be risk aversive" (Gary M. Bakken, H. Harvey Cohen, A. S. Hyde, Jon R. Abele (2002) „Slips, Trips, Missteps and Their Consequences, Lawyer's and Judges Publishing company, Inc., Tucson 2nd Ed. P.47) when executing above-average investments.

The next factor is the granted ***access to credit*** which examined that PV is coupled to very high initial investment costs.

As utility companies are examined as an own group linked to the government it should be checked if the ***utilities' attitude*** is "intolerant of competition from other (often smaller) investors *(*Mendonza, M. (2007)"Feed in tariffs: accelerating the deployment of renewable energy", World future council, Earthscan, London P. XIII).

A further force identified is the ***skilled personnel*** situation, as smooth market functioning requires low-cost access to requisite skilled workers. *(*Mendonza, M. (2007)"Feed in tariffs: accelerating the deployment of renewable energy", World future council, Earthscan, London P. XIV)

As examined in appendix 6 value chain, the ***availability of resources*** within this value chain can provide a competitive advantage and can drive the success of the FiT. If resources are available abundantly then manufacturers needn't import the resources and can produce and sell PV modules for a lower price.

The ***pricing and remuneration*** proposals presented in the situation analysis of the FiT in Malaysia are also potentially relevant to have an impact on success of the system. The "right"

price represented a major incentive to apply for the FiT in Europe in order to decrease the risk of the high initial investment.

Political conditions

The political conditions contain forces concerning the political impact on PV and the FiT's. ***Pressure from international obligations*** namely the Kyoto protocol, neighbouring states or other climate conventions might force the government to promote PV in future (Bechberger, M. & Reiche, D. "The spread of renewable energy feed-in tariffs (REFITs) in the EU-25").

Restrictions on ***siting and construction*** such as "height, aesthetic, noise or safety" *(*Mendonza, M. (2007)"Feed in tariffs: accelerating the deployment of renewable energy", World future council, Earthscan, London P. 5) concerning the application of the building integrated PV (BIPV) can influence the success of the FiT as well.

In addition a force was examined dealing with the ***legal framework*** of the FiT procedure. This contains the precision of documents and the legal security of the process. (Bechberger, M. & Reiche, D. "The spread of renewable energy feed-in tariffs (REFITs) in the EU-25").

The next three identified forces refer to the Malaysian Government. First of all ***political stability*** was identified as one force which could impact the FiT as the outcome of votes might endanger the success of the system. Furthermore the ***consistency of the policy*** might also influence consumers' and industries' decisions to promote and invest in photovoltaic. Along with the political consistency the force ***political commitment*** is identified. If the Government pushes a topic for a long time and walks the talk it is probably able to raise an awareness which impacts the situation *(*Mendonza, M. (2007)"Feed in tariffs: accelerating the deployment of renewable energy", World future council, Earthscan, London XVI).

A force which is constituted to have had a very high impact on the success of the FiT in Germany has been the ***planning security*** which describes how long investors are guaranteed a tariff. "The new Spanish REFIT [e.g.] guarantees fixed remunerations for the whole lifetime of a RES installation" (Bechberger, M. & Reiche, D. "The spread of renewable energy feed-in tariffs (REFITs) in the EU-25").

A decisive force in Poland which led to a negative impact on the success of the FiT system was the ***permit procedure***. A RES (renewable energy source) installation required agreements of more than 35 public-sector entities on central, regional, prefectural and local level. (Bechberger, M. & Reiche, D. "The spread of renewable energy feed-in tariffs (REFITs) in the EU-25").

Last but not least the ***alternative systems*** to the FiT which are in place for photovoltaic in Malaysia as examined in chapter XX can also have a driving or restraining influence on the success of the process.

Individual conditions

Individual conditions contain forces which contain the individual opinion of society regarding the PV and the Feed-in-Tariff system
For this study the only individual force examined is the ***trust of individuals in the FiT system***. If there is a high conviction and acceptance for this initiative in Malaysia it might have a positive impact on the result of the system.

Technical conditions
Technical conditions contain forces with regard to possible technical limitations which might hinder the success of the FiT system in the first place.

One factor identified is ***access to the grid***. If many people in Malaysia would have had no access to the grid they may increase the level of generated photovoltaic energy, but they will not increase the success of the FiT which only applies for grid-systems.

In addition to that the ***grid structure*** might have an impact as well which can generally be distinguished into radial-, loop- and mesh- grid structure, differing in their complexity and elaborateness (Coster, E. J. (01.09.2006)"Distribution Grid Operation Including Distributed Generation" P.14). It can be assumed the easier a grid structure is build up, the easier it will be to connect PV projects to the national grid.

The third and merely summarising force is the Malaysian communication and transport ***infrastructure*** *(*Mendonza, M. (2007)"Feed in tariffs: accelerating the deployment of renewable energy", World future council, Earthscan, London P. XIV). It is assumed the more communication and transport infrastructure are developed, the more efficient the FiT system can be implemented around Malaysia.

Cognitive conditions
Cognitive conditions represent forces which concern the public awareness of the FiT system.
One force identified here is the changing trend in Europe from ***de-central to central applications*** of the system, which "reduces prices in some cases, and in any case fits the dominant belief system of the energy industry" (Bechberger, M. & Reiche, D., "The spread of renewable energy feed-in tariffs (REFITs) in the EU-25").

As the last force ***environmental awareness*** was identified which pushes the renewable energy market in Europe. Dutch households for example had already decided for green electricity by January 2003 (Bechberger, M. & Reiche, D. "The spread of renewable energy feed-in tariffs (REFITs) in the EU-25").

Appendix 17: Introduction to questionnaire

Forces influencing the success of the Malaysian photovoltaic Feed-in-Tariff system

Dear interviewee,

Thank you very much for supporting me with my Bachelor Thesis project in renewable energies. It is important that you read this introduction carefully.
This questionnaire is relevant to everyone who has a relationship to renewable energies in Malaysia, preferably within the photovoltaic sector.
The questionnaire will **not take more than 10 minutes** of your time.
I would like to clarify at this stage that every piece of information will be **treated highly confidential and will not be distributed or forwarded to any other party or system**.

Structure:

The questionnaire is structured into seven parts.
Each part will be presented on a seperate page within this interview.
You can go to the next part/page by clicking on the "next" button on the bottom of the screen.

Overview of the parts:
0. Contact data
1. Natural conditions
2. Market conditions
3. Political conditions
4. Individual conditions
5. Technical conditions
6. Cognitive conditions

Every condition includes an amount of forces which can be classified in three different ways within a single answer matrix choice:

1. As a **force** to **drive** the success of the FiT system.
2. As a **force** to **restrain** the success of the FiT system.
3. As a **force without any impact** on the success of the FiT system.

Procedure:

1. Please begin by filling in your **contact data**.
2. Please classify each following force either as **driving**-, **restraining**-, or **no impact** force.

2.1 If you think it is a **driving force** then classify the degree of the **driving force** from **1-10** (with 10 being the highest value) and classify the **restraining force** degree as **0.**
2.2 If you think it is a **restraining force** then classify the degree of the **restraining force** from **1-10** (with 10 being the highest value) and classify the **driving force** degree as **0.**
2.3 If you think it has **no impact** on the success of the FiT system in Malaysia then classify both the **restraining and driving force** degree as **0.**

Please answer all of the questions in one of the three ways mentioned above.
If you are not sure about a force then please fill in according to 2.3 (no impact).
Do not give both driving- and restraining force a value >0 at the same time!

You will always have the possibility as well to fill in additional notes, remarks, questions within one field.

Your progress on the pages you have viewed so far will be displayed in the upper part of the screen.

P.S. I am very sorry about the advertisements on this page. Just try to ignore them.

Thank you very much for your support again and if you have any further questions or remarks, please do not hesitate to contact me!

Kind regards,

Marc von der Forst
marcvdf@gmail.com
0060-13-256 09 85

Question 6*

Relation to photovoltaic industry/ renewable energies in Malaysia {e.g. position, expertise, company, projects}

Text Answers (15)	View
Yes	View
projects	View
trading solid biomass	View
???	View
nil	View
consultant for BMWi, Exportinitiative Erneuerbare Energien	View
architect, specifier	View
Journalist	View
I was a Technical Advisor on the UNDP/GEF supported MBIPV project from 2006 to end 2010, when my assignment on the project ended.. I am also an Associate of the Academy of Sciences Malaysia & a member of its Alternative Energy Task Force.	View
Consultant	View
business development	View
some	View
PV Manufacturer	View
in green technology sector	View
Company	View

Question 7*

Force: Dependency on energy imports

Explanation: In how far is the dependency on the energy import situation in Malaysia restraining or driving the success of the Feed-in-Tariff (FiT) system?

	0	1	2	3	4	5	6	7	8	9	10	Responses	Total
Driving Force	**35%**	**6%**	0%	**6%**	**6%**	**6%**	**18%**	**6%**	**18%**	0%	0%	**17**	**50%**
Restraining Force	**47%**	0%	**12%**	0%	**12%**	0%	0%	**12%**	**18%**	0%	0%	**17**	**50%**

ID	Additional comment field	View Survey
5474875	hhhaaa	View
5547698	malaysia doesn;t depend on oil import they have still sufficient reservres	View
5563378	Is there an energy import?	View
5603435	needs explanation	View
5609118	FiT has yet to start so it has no effect as yet. Other RE development has bee restrained by the unattractive tariff paid by the utility in purchasing RE powered electricity.	View
5645118	can't comment	View

Question 8*

Force: Subsidies on fossil fuels

Explanation: In how far do subsidies imposed on fossil fuels in Malaysia drive or restrain the success of the FiT system?

	0	1	2	3	4	5	6	7	8	9	10	Responses Total	
Driving Force	47%	0%	6%	12%	12%	0%	6%	18%	0%	0%	0%	17	50%
Restraining Force	6%	0%	12%	6%	0%	6%	18%	6%	18%	6%	24%	17	50%

ID	Additional comment field	View Survey
5547698	although malaysia is talking about alkternative energies despite of a very questionable bio diesel policy it is just talking	View
5609118	Utilities have no interest to buy RE powered electricity as they enjoy better profits from the subsidised gas price for power generation.	View

Question 9*

Force: Market stability

Explanation: How stable and secure is the whole photovoltaic (PV) market in Malaysia and what effect does this have on the success of the FiT system?

	0	1	2	3	4	5	6	7	8	9	10	Responses Total	
Driving Force	13%	13%	7%	7%	0%	20%	0%	0%	13%	13%	13%	15	50%
Restraining Force	47%	0%	0%	7%	0%	7%	7%	13%	7%	13%	0%	15	50%

ID	Additional comment field	View Survey
5547698	as long corruption and cronism is protecting the current system there is no immediate change to be expected	View
5609118	This is not possible as there isno	View
5645118	can't comment	View

Question 10*

Force: Access to credit

Explanation: How easily can loans be obtained/ can access to credit be granted in order to finance the high investment of a photovoltaic installation in Malaysia?

	0	1	2	3	4	5	6	7	8	9	10	Responses Total	
Driving Force	20%	0%	7%	13%	13%	27%	13%	7%	0%	0%	0%	15	50%
Restraining Force	13%	7%	0%	7%	7%	13%	20%	7%	20%	7%	0%	15	50%

ID	Additional comment field	View Survey
5547698	if you are a Bumi, no problem any credit is given, if you are no bumi (malay) it is rather full of restrictions	View
5609118	Absence of financing has not affected installation of BIPV systems under the sURIA 1000 project component of the MBIPV project.	View
5645118	can't comment	View

Question 11*

Force: Attitude of utility companies

Explanation: Do the utility companies in Malaysia tend to drive or restrain the success of the FiT system through their attitude towards promoting photovoltaic as a part of renewable energies?

	0	1	2	3	4	5	6	7	8	9	10	Responses Total	
Driving Force	40%	13%	0%	7%	0%	20%	0%	13%	0%	7%	0%	15	50%
Restraining Force	13%	7%	0%	7%	7%	0%	13%	13%	13%	13%	13%	15	50%

ID	Additional comment field	View Survey
5474875	askdfgkasdf	View
5547698	they are not likely to change, with the argument for what	View
5603435	it is a budget issue for TENAGA	View
5609118	utitlites are not driving the FiT system, not the developemnt of RE soures of power generration. They have no objections to FiT since teh	View
5645118	can't comment	View

Question 12*

Force: Skilled personal

Explanation: Does the workforce, skilled in maintaining and setting up the photovoltaic systems in Malaysia at the moment, drive the success of the system or restrain it?

	0	1	2	3	4	5	6	7	8	9	10	Responses Total	
Driving Force	27%	13%	7%	13%	7%	7%	7%	7%	7%	0%	7%	15	50%
Restraining Force	33%	0%	7%	7%	7%	7%	7%	13%	7%	7%	7%	15	50%

ID	Additional comment field	View Survey
5547698	what kind of skilled personnel, this is simply suppressed by law	View
5609118	They are hevily dependent on the government subsidies such as under teh SURIA 1000 program & the rural electrification program for the rural communities.	View

Question 13*

Force: Availability of resources

Explanation: Does the situation in Malaysia regarding the availability of resources to manufacture photovoltaic solar panels have a driving or restraining effect on the success of the FiT system

	0	1	2	3	4	5	6	7	8	9	10	Responses Total	
Driving Force	27%	0%	0%	13%	7%	27%	0%	13%	7%	0%	7%	15	50%
Restraining Force	40%	13%	0%	0%	7%	7%	13%	7%	7%	7%	0%	15	50%

ID	Additional comment field	View Survey
5547698	wishful thinking of some politician, malaysia doesn't have the technology or skilled workers to implement this technology even if the government wants this (see example biotechnology, what happen to this.....)	View
5609118	FiT has yet to materialise.	View
5641836	Q-Cells Malaysia !	View

Question 14*

Force: Pricing and remuneration

Explanation: Does the actual FiT allowance proposal for generated photovoltaic energy have a driving or restraining effect on the success of the FiT system?

RM1.23 per kWh (plus 26 sen bonus) if <= 4 kWp (kilo-watt peak)
RM1.20 per kWh (plus 20 sen bonus) if > 4 kWp
RM0.95 per kWh 1-10 MWp
Source: Starbizweek (09.04.2011) "Higher income for home solar energy"

	0	1	2	3	4	5	6	7	8	9	10	Responses	Total
Driving Force	13%	0%	0%	0%	7%	13%	7%	27%	13%	7%	13%	15	50%
Restraining Force	33%	7%	0%	0%	20%	13%	7%	0%	7%	7%	7%	15	50%

ID	Additional comment field	View Survey
5474875	ddddd	View
5547698	what is this current elctricity costs from 0,286 to 0, 5 RM per kw/h, why should customer change they are not interested in an increase of energy cost	View
5609118	The proposed tariffs are rather high in today's capital cost situation and basically burden all electricity consumer to favour the few who can afford to install PV systems. Although I was a part of teh MBIPV Team, I have conflicting views on teh FiT rates, especially for teh PV systems.	View
5641836	also depending on solar irradiation !	View

Question 15*

Force: Pressure from international obligations

Explanation: Do protocols, climate conventions and the renewable energy status of the neighbouring states restrain or drive the success of the FiT system?

	0	1	2	3	4	5	6	7	8	9	10	Responses	Total
Driving Force	7%	7%	0%	20%	7%	20%	13%	13%	7%	7%	0%	15	50%
Restraining Force	47%	13%	0%	0%	13%	7%	7%	0%	7%	7%	0%	15	50%

ID	Additional comment field	View Survey
5547698	don't care, they are interested how does this fit in their "system"	View
5609118	It is not protocols or climate conventions that drive the FiT, but the	View

Question 16*

Force: Siting and construction

Explanation: Do the siting and construction regulations restrain or drive the installation of photovoltaic systems in Malaysia; and therefore also the success of the FiT system?

	0	1	2	3	4	5	6	7	8	9	10	Responses	Total
Driving Force	47%	0%	0%	7%	20%	13%	7%	7%	0%	0%	0%	15	50%
Restraining Force	40%	0%	13%	7%	0%	7%	7%	13%	0%	13%	0%	15	50%

ID	Additional comment field	View Survey
5547698	if it fits local cronies, they will install, no matter costs or benfits to public, they represent always personal interest	View

Question 17*

Force: Legal framework

Explanation: Does the legal framework in Malaysia as a whole drive or restrain the success of the FiT system?

	0	1	2	3	4	5	6	7	8	9	10	Responses	Total
Driving Force	13%	0%	7%	20%	7%	13%	0%	13%	7%	13%	7%	15	50%
Restraining Force	40%	7%	7%	0%	7%	7%	0%	7%	13%	13%	0%	15	50%

ID	Additional comment field	View Survey
5547698	there is a lot of room of interpretation	View
5609118	To datge the legislation is not in place to have any impact. When teh RE Act is finally passed for implementation, tehn the legal framework will drive the development of teh RE power industry, NOT the FiT, which is just a mnechanism to promote RE.	View

Question 18*

Force: Political stabiliy

Explanation: In how far does the political stability situation in Malaysia have an influence on the success of the FiT system?

	0	1	2	3	4	5	6	7	8	9	10	Responses	Total
Driving Force	33%	0%	0%	7%	20%	0%	0%	27%	0%	7%	7%	15	50%
Restraining Force	47%	7%	7%	7%	7%	0%	13%	0%	13%	0%	0%	15	50%

ID	Additional comment field	View Survey
5609118	The impact has yet to be seen, though the very attractive FiT rates for PV will certainly be a strong force to drive RE power generation.	View

Question 19*

Force: Political consistency

Explanation: Is the policy consistent in promoting the utilization of photovoltaic energy in Malaysia and does it drive or restrain the success of the FiT system in the future?

	0	1	2	3	4	5	6	7	8	9	10	Responses	Total
Driving Force	7%	0%	0%	0%	20%	53%	0%	20%	0%	0%	0%	15	50%
Restraining Force	40%	7%	7%	7%	7%	7%	13%	7%	7%	0%	0%	15	50%

ID	Additional comment field	View Survey
5547698	it is suiotable as long some individual do profit from this technology	View
5609118	Yes, the political environmant is virtually taking advantage of the RE industry developoment, especially PV, I believe more as a gimic than true political belief and conviction.	View

Question 20*

Force: Political commitment

Explanation: Is the government commited to increasing the amount of generated photovoltaic energy. In how far does the degree of commitment drive or restrain the success of the FiT system?

	0	1	2	3	4	5	6	7	8	9	10	Responses Total	
Driving Force	7%	0%	0%	0%	20%	7%	13%	20%	13%	7%	13%	15	50%
Restraining Force	40%	7%	7%	13%	0%	13%	0%	7%	7%	7%	0%	15	50%

ID	Additional comment field	View Survey
5547698	theoretical they are interested, but practical only when it is profitable for a minority of special group	View
5609118	The government is pushing for teh FiT so long as it does not have to pay for the costs incurred, as teh electricity consumers have to pay for teh incremental FiT rates.	View

Question 21*

Force: Planning security

Explanation: In how far does the fact that a FiT allowance is guaranteed in Malaysia for 21 years have an influence on the success of the system?

	0	1	2	3	4	5	6	7	8	9	10	Responses Total	
Driving Force	0%	0%	7%	7%	7%	13%	0%	13%	7%	33%	13%	15	50%
Restraining Force	40%	7%	13%	0%	0%	20%	7%	0%	7%	7%	0%	15	50%

ID	Additional comment field	View Survey
5547698	who profits?	View
5609118	This is NOT a PLANNING SECURITY issue; it is just taking advantage of eh opportunity presented.	View

Question 22*

Force: Permit procedures

Explanation: Does the permit procedure for a photovoltaic system in Malaysia result in a driving or a restraining force influencing the success of the FiT system?

	0	1	2	3	4	5	6	7	8	9	10	Responses Total	
Driving Force	27%	0%	7%	7%	7%	27%	0%	7%	20%	0%	0%	15	50%
Restraining Force	33%	7%	7%	0%	0%	27%	13%	0%	13%	0%	0%	15	50%

Question 23*

Force: Alternative systems

Explanation: How do the actual installed alternative systems, promoting the generation of photovoltaic energy, influence the introduction of the FiT system?

	0	1	2	3	4	5	6	7	8	9	10	Responses	Total
Driving Force	21%	7%	0%	7%	7%	29%	7%	0%	7%	14%	0%	14	50%
Restraining Force	43%	14%	7%	0%	0%	7%	14%	0%	14%	0%	0%	14	50%

ID	Additional comment field	View Survey
5514721	question is not clear	View
5603435	the more systems are working the better - lighthouse effect	View

Question 24*

Force: Trust in the system

Explanation: Do you believe the Malaysian population has faith in the system or are they rather sceptical? How does trust or scepticism influence the success of the FiT system then?

	0	1	2	3	4	5	6	7	8	9	10	Responses	Total
Driving Force	21%	0%	0%	14%	7%	21%	21%	0%	14%	0%	0%	14	50%
Restraining Force	29%	7%	7%	7%	7%	0%	14%	7%	7%	7%	7%	14	50%

ID	Additional comment field	View Survey
5609118	The small portion of the population who can & will benefit (probably only about 1,0000 households in the next 5 to 10 years) have strong belief in teh FiT system for PV. The bulk of the population is unconcernd as they CANNOT AFFORD to take advantage of the system, while almost 7million consumers have to pay for teh top-up costs, though the lowest electricity users will not pay directly but their share will need to be borne by the remainder of the consumers..	View

Question 25*

Force: Grid access

Explanation: Does grid access situation in Malaysia have a driving or restraining force on the success of the FiT system?

	0	1	2	3	4	5	6	7	8	9	10	Responses	Total
Driving Force	36%	0%	7%	0%	14%	14%	21%	7%	0%	0%	0%	14	50%
Restraining Force	29%	0%	0%	14%	0%	21%	14%	14%	7%	0%	0%	14	50%

ID	Additional comment field	View Survey
5514721	what grid access situation? location, policy, cost?	View

Question 26*

Force: Grid structure

Explanation: In how far does the actual Malaysian grid structure influence the success of the FiT system?

	0	1	2	3	4	5	6	7	8	9	10	Responses	Total
Driving Force	43%	0%	7%	7%	0%	21%	7%	14%	0%	0%	0%	14	50%
Restraining Force	21%	7%	0%	7%	0%	29%	7%	14%	14%	0%	0%	14	50%

ID	Additional comment field	View Survey
5514721	??	View
5609118	The current grid structure restrains RE other than PV, but this will change when the RE Act is passed & enforced.	View

Question 27*

Force: Infrastructure

Explanation: Does the Malaysian infrastructure have a restraining or driving force on the success of the FiT system?

	0	1	2	3	4	5	6	7	8	9	10	Responses	Total
Driving Force	36%	0%	0%	7%	0%	36%	0%	7%	7%	7%	0%	14	50%
Restraining Force	21%	0%	0%	7%	0%	43%	14%	0%	14%	0%	0%	14	50%

ID	Additional comment field	View Survey
5474875	almost finished....	View
5609118	Not as far as it concerns PV.	View

Question 28*

Force: Central vs. decentral application

Explanation: Does a centralisation (economies of scale) or decentralisation of applications for photovoltaic in Malaysia have a driving or restraining effect on the success of the FiT system?

	0	1	2	3	4	5	6	7	8	9	10	Responses	Total
Driving Force	29%	0%	0%	7%	21%	14%	14%	7%	7%	0%	0%	14	50%
Restraining Force	50%	0%	0%	0%	0%	21%	21%	7%	0%	0%	0%	14	50%

ID	Additional comment field	View Survey
5603435	depends on technical parameters	View
5609118	Yet to be detected as FiT is not in place yet.	View

Question 29*

Force: Environmental awareness

Explanation: How high is the environmental awareness in Malaysia and to which extent does this awareness influence the success of the FiT system?

	0	1	2	3	4	5	6	7	8	9	10	Responses	Total
Driving Force	14%	7%	7%	29%	7%	7%	14%	7%	0%	7%	0%	14	50%
Restraining Force	36%	7%	0%	0%	14%	0%	7%	14%	7%	7%	7%	14	50%

ID	Additional comment field	View Survey
5474875	finally..... finished ;)	View
5603435	education is weak	View
5609118	Environmental awareness is a characteristic of only a small portion of the population. The majority support it so long as it does not cost them any financial burden	View

Appendix 19: Calculation of interview results

Force	Result driving or restraining force
Subsidies on fossil fuels	-3,941176471
Attitude of utility companies	-3
Grid structure	-1,428571429
Access to credit	-1,4
Siting and construction	-0,8
Skilled personal	-0,733333333
Grid access	-0,714285714
Infrastructure	-0,642857143
Environmental awareness	-0,285714286
Trust in the system	0,214285714
Permit procedures	0,6
Dependency on energy imports	0,705882353
Central vs. Decentral application	0,857142857
Availability of resources	1
Market stability	1,466666667
Legal framework	1,466666667
Political stability	1,6
Alternative systems	1,642857143
Political consistency	2,066666667
Pressure from international obligations	2,266666667
Pricing and remuneration	2,466666667
Political commitment	3,466666667
Planning security	4,2

Appendix 22: Statement of authenticity

APPENDIX 6: STATEMENT OF AUTHENTICITY

Example:

I hereby solemnly declare,

1. that I myself wrote my graduation report, without the assistance of any third party;
2. that in my report, I identified and specified all direct literal quotes from literature and indirect quotes (ideas/indirect quotations) from other authors.

I am fully aware that any violation of this code may result in disadvantageous consequences for me (for example withdrawal of study credits and, in the case of a repeated violation, withdrawal of complete study units). If fraud can be proved, I will be required to bear the costs of investigation into and sourcing of the original document.

Place, date

Kuala Lumpur, 19.05.2011

Signature

(Marc van der Forst)