



جامعة الجميع الذكية
EVERYONE'S SMART UNIVERSITY

Everyone's Smart University

Project (Spring 2021)

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Section

Master

Date

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(PMG510)

Project Risk Management

Instructions:

- آخر موعد للتسليم هو يوم السبت 2021-05-08 في تمام الساعة ٩ مساءً.
- الإجابة متاحة باللغة الإنجليزية أو اللغة العربية مع مراعاة أن تكون المصطلحات العلمية باللغة الإنجليزية.
- يتم تسليم المشروع في صيغة ملف pdf مع الالتزام نموذج الجامعة ولن تقبل أي مستندات أخرى.
- يجب مراعاة أقسام البحث الرئيسية (مقدمة Introduction، دراسات علمية سابقة Literature Review، طريقة البحث Methodology، النتائج والمناقشة Results and Discussion، وأخيراً المراجع References. وإن كان هناك ملحقات Appendices يتم إضافتها)
- يجب الالتزام بـ Theme موحد كما يلي:
- حجم الخط 12.
- نوع الخط Arial.
- لون الخط أسود.
- المسافة بين الأسطر 1.5 line spacing
- عدد صفحات البحث (لا يقل عن ثلاث صفحات ولا يزيد عن ست صفحات).

Instructor's Name: Eng. Mosaab M. Hamed

Project:

Risk Identification and Analysis (Based on the project you chose in APM)

The objective of this report is to identify project risks, prepare a risk probability matrix, and carry out an analysis of selected risks. Referring to the project you select in **Advanced projects management APM course**, your task is to prepare a risk management plan that identifies potential risks in **the selected stage of the project** and identify risk management strategies.

From the course content and readings, you know that the overall purpose of risk planning is to anticipate possible risk events and be ready to take appropriate action when risk events occur—to eliminate or reduce negative impacts on the project.

You may wish to begin this exercise with a brainstorming about potential risks to get candidate risks “on the table” for consideration. And then identify and refine that wording for risks that have some realistic chance of occurring in this stage. For example, potential weather problems present a real obstacle to completing field data collection by the planned completion date. It is also an issue that the project manager will ultimately have to plan for, as opposed to other issues such as a major disaster (e.g., your office burning down), is not a high-enough probability event that requires much time in planning. As described below, you will select several of the identified risks and carry out a risk analysis.

You will use the distilled list of risks to make a risk probability/impact matrix. The matrix will have at least three categories (high/medium/low) for probability and impact.

Remember that it is important to name risks effectively—use words that describe the risk event and point to the impact on the project (e.g., “injury of field technician disrupts data installation work”).

After completion of the risk matrix, document a risk analysis for the selected risks. This detailed documentation for that selected risk will include:

- a description of the risk and potential impacts (schedule, quality of work, cost, etc.) on the project.
- indicators or triggers that would be monitored to help identify the risk as early as possible.
- specific risk response strategies to take.

Using probability and impact matrix calculate the **Expected Monetary Value (EMV)** for all risks that have the impact in terms of cost \$\$.

Best of luck...

المشروع:

التعرف على المخاطر وتحليلها (بحث مبني على مشروعك الذي اخترته في مادة ادارة المشاريع المتقدمة)

الغرض من هذا التقرير هو التعرف على المخاطر المحيطة بالمرحلة التي تختارها المرحلة من مراحل مشروعك (نفس المرحلة التي اخترت التطرق لها في مشروعك لمادة إدارة المشاريع المتقدمة Advanced project management) حيث أن مهمتك هي تحضير خطة متكاملة لإدارة المخاطر تشمل التعريف بالمخاطر المحتملة التي تحيط بتلك المرحلة وتحضير مصفوفة احتمالية المخاطر ومن ثم القيام بالتحليل لهذه المخاطر المختارة وتحديد استراتيجيات ادارة المخاطر المناسبة لكل خطر على حدة.

من محتويات المقرر والمصادر الأخرى المتاحة أصبحت تعلم الان أن الغرض العام لمرحلة التخطيط للمخاطر هي توقع أحداث المخاطر المحتملة والتجهز لاتخاذ ردة الفعل المناسبة عند وقوع الخطر – لمنع أو تقليل الآثار السلبية على المشروع.

قد تحبذ بداية هذا البحث بعصف ذهني عن ماهية المخاطر التي قد تحيط بتلك المرحلة من مراحل مشروعك, وذلك للحصول على قائمة بتلك المخاطر. ومن ثم تحديد وتصفية هذه القائمة للوصول إلى قائمة مختصرة بالمخاطر التي لها فرصة واقعية أكبر في الحدوث. على سبيل المثال: المشاكل الجوية المتوقعة والتي تمثل عقبة حقيقية أمام اكتمال جمع البيانات من المواقع في أو قبل الوقت المحدد، هذه تعتبر مشكلة على مدير المشاريع أن يضعها في الحسبان. من ناحية أخرى، فإن المخاطر غير الواقعية مثل الكوارث الطبيعية والأعاصير (تلك التي تسبب حريقاً بمكتبك وفقدان الأوراق المهمة) ليست لها احتمالية وقوع عالية وبالتالي لاتستدعي تضيق الكثير من الوقت في التخطيط لها. كما سيتبين لك، ستقوم باختيار عدة مخاطر من تلك التي قمت بالتعرف عليها لتحليلها.

ستقوم باستخدام هذه القائمة المختصرة لعمل مصفوفة المخاطر (الاحتمالية/الأثر). المصفوفة ستحتوي على الأقل على ثلاث تصنيفات (عالي/متوسط/منخفض) للإحتمالية والأثر.

لاتنس استخدام أسماء تصف طبيعة المخاطر بصورة فعالة – قم باستخدام كلمات تصف الحادثة الخطرة وتشير الى أثرها على المشروع (مثل: إصابة أحد الفنيين في الموقع مما يؤثر على أعمال التركيب).

بعد انتهاءك من مصفوفة المخاطر، قم بتوثيق تحليلك للمخاطر المختارة. هذا التسجيل المفصل للمخاطر يجب أن يتضمن:

- وصف للخطر واثاره المحتملة (الجدولة، جودة العمل، التكلفة، الخ)
- المؤشرات والمحفزات التي يجب مراقبتها للمساعدة في التعرف على هذا الخطر قبل وقوعه
- تفصيل للاستجابة المقترحة للتصدي لهذا الخطر

باستخدام مصفوفة الاحتمالات والتأثير ، احسب القيمة النقدية المتوقعة (EMV) لجميع المخاطر التي لها تأثير من حيث التكلفة \$\$.

مع تمنياتي بالتوفيق..

Grid-Connected Rooftop Photovoltaic Systems Project in the Residential Sector of the Kingdom of Saudi Arabia

1. Introduction:

Fuel Consumption for Electricity Generation in Saudi Arabia, electricity is mostly generated using crude oil and refined petroleum products and this would not change even under existing policies for fueling future generation capacity. Figure 10 presents the amounts of fuels we project as being used for electricity generation in the years 2015 and 2032; these values take into account fuels used for co-generation. The consumption of crude oil would decline significantly in the alternative scenarios or be discontinued altogether. Oil-fired generation would be replaced with natural gas and alternative technologies, except in the Investment Credits Scenario. Despite unchanged gas allocation, replacing turbines with combined-cycle plants frees up the gas needed to expand gas-fired generation. According to our model, all forms of oil would be removed from the power system by the year 2022 with immediate deregulation □ crude oil would no longer be used as from the year 2018. The sustainable development of energy systems is increasingly important for politicians and decision-makers worldwide. The main objectives of the overall policies of states often include economic growth, energy security, and mitigating the effects of climate change [1]. Use of sustainable energy means not only providing enough energy for current and future energy needs, but also the protection of the environment and the integrity of ecosystems [2]. Therefore, the sustainability of future energy systems by itself does not guarantee sustainable development; technical and financial factors must always be taken into account. Renewable energy facilities require a solid infrastructure to generate distribute energy resources. This requires proper planning and management in construction, as well as compliance with environmental and social concerns in order to meet sustainable building guidelines the development of these infrastructures requires great efforts by researchers, designers, financiers, owners, customers, and builders to attempt to cause the least possible risk. Investment in such projects is usually quite high, so energy companies and investors should avoid making poor decisions.

In addition, as a result of the continuing rapid changes in climatic conditions of the planet, helping potential investors and the different administrations to assess, mitigate and insure risks, will generate a significant business opportunity for services managing such risks. it is, therefore, of great interest to have in-depth knowledge regarding the technological, social, and environmental constraints that may arise, and the necessary investments, and the economic and political interests that may appear [3].

2. Literature review:

Risk management is a process that takes place during all phases of the project life. In it, through a sequence of activities including assessment, development strategies and mitigating risks, uncertainties concerning a threat are handled. The analytical approach is based on models of financing projects through three different dimensions: analysis of contracts and institutional relations; estimates and financial modeling; or risk assessment allocation [4].

3. Methodology:

Analyze the key risk factors and outline possible strategies or attention areas. Assess both the likelihood and impacts. Outline those approaches that minimize or address the most important risk area.

Possible Risk Area	Mitigation
Risk of doing nothing	— Comprehensive scan of the market, competitive environment, trends, and drivers for community solar, and evaluation of appropriate responses to meet member-consumer demand, if needed
Financial risk	— Careful modeling and analysis of the financial options and drivers that will impact financial results
Lack of participation or underperforming subscriptions	— Clearly describe the overall value proposition — Ensure a comprehensive marketing and communications plan — Model worst-case scenarios — Make adjustments in project scale
Solar system underperformance	— Strong vetting process of the selected solar infrastructure design, technology selection, and installation team — Performance guarantees from vendors
Land availability and acquisition costs	— Negotiate land acquisition options — Understand advantages/disadvantages of property siting options — Clearly understand siting zoning regulations
Environmental, permitting, siting, and decommissioning risks	— Anticipate and consider all related elements, including federal, state, and local requirements; environmental impacts; decommissioning, etc. — Design system to minimize decommissioning costs

Cyber security and software interoperability risks	— Identify data that require confidential management — DOE cyber security procurement language — Cyber security risk insurance — MultiSpeak compatibility — Software documentation — Vendor selection, with IT criteria
Hidden costs	— Research and learn from other installed systems — Anticipate sources of hidden costs — Ensure comprehensive review of internal resource impacts — Engage subject matter experts to assess the cost elements
Project delays	— Establish clear project roles — Ensure comprehensive project and schedule with effective project management controls — Incorporate contingency into schedule
Legal and regulatory risks	— Seek legal counsel or CPA firm (as appropriate) with expertise on enabling statutes; bylaws; applicable federal and state environmental, renewable, zoning, and land-use regulations; tax law; SEC regulations; existing funding requirements of entities such as RUS; and utility regulations — Collaborate or contract with third parties that have expertise; although third-party expertise can be valuable, it is not a substitute for legal counsel
Staffing risk	— Ensure that assigned Project Manager and other key staff have the right skills, capabilities, and bandwidth — Cost-benefit analysis of insourcing vs. outsourcing various duties
Political risk	— Coordinate with political and legal counsel — Contact political stakeholders for insights

Avoid	Change the project plan to eliminate the risk or to protect the project objectives (time, cost, scope, quality) from its impact. This can be achieved by modifying scope, adding contingency to the project plan either as additional time for critical path activities, or adding resources. Some threats that arise early in the project can be avoided by clarifying requirements, obtaining information, improving communication or acquiring expertise.
Mitigate	Reduce the probability and/or impact of an adverse risk event to an acceptable threshold. Taking early action to reduce the probability and/or impact of a risk is often more effective than trying to repair the damage after the risk has occurred. Risk mitigation may take resources or time and hence may represent a tradeoff. However, the overall result may reduce risk to the overall project objectives.
Transfer/Share	Shift the negative impact of a threat to a third party through: insurance, performance bonds, warranties, guarantees, incentive/disincentive clauses, cost+time contracts, provided the price for the risk transfer can be supported by project cash flow. Transference reduces the risk only if the person to whom the risk is transferred (such as the contractor) is better able to take steps to reduce the risk and does so. Risk transference nearly always involves payment of a risk premium to the party taking on the risk.
Acceptance	Adopted if it is either not possible to eliminate that risk from a project or the cost in time or money of the response is not warranted by the potential impact of the risk. The most common active acceptance strategy is to establish a contingency reserve, including amounts of time, money, or resources to handle the threat or opportunity.

Risk Severity and Frequency numerical values

Risk-tier	Description
Utility company or grid	Risks related to operations: not meeting demand, brownouts, blackouts, etc.
Project Management/Development	Risks that may be encountered throughout the development of the PV project: changes in costs, design issues, permit issues, etc.
Hardware	Risks related to the hardware components of the system: reliability
Environmental and Social	Risks related to the location and surrounding environment of the project: effect on local habitats, weather, environmental opposition, etc.
Government	Risks related to changes in governmental policies and priorities

Description	Metric
Extreme	blue
Very High	Light blue
High	Red
Medium	Light red
Low	Yellow
Very Low	Light Green
Negligible	Green

Risk Control Strategies

1. Technical							
Events	Potential effect	Frequency (event/year)	Severity	Estimated Risk	Mitigation/Strategy	Risk Control Strategy	Risk taker
Performance of technology	Lower yield =lower revenues.Losses = lost.MWh x tariff	Continued	High	Low	Proven technology Quality components Correctly dimensioned Manufacturer warranties and performance guarantees and terms	Transfer	Manufacturer, EPC Contractor
Technical Availability		Low	High	Low		Transfer	Manufacturer, EPC Contractor O&M Contractor
Connection to the grid fails	Power cannot	High	High	High	Substation constructed with the project Take-and-pay PPA	Transfer, Accept	Utility
Financial strength manufacturer (low risk of default = capability to fulfil guarantees)	Inability to fulfil warranties and guarantees	Low	High	Low	Track record, financial strength of mother company	Transfer	Manufacturer
2. Energy Resource							
Events	Potential effect	Frequency (event/year)	Severity	Estimated Risk	Mitigation/Strategy	Risk Control Strategy	Risk taker
Variability of irradiation data	Uncertain yield	Medium	High	Low	Use of different data bases, on-site irradiation measurements	Mitigate	Developer/ Consultants
Quality of irradiation data	Overestimation of yield	Medium	High	Low	Use of proven databases with well correlated theoretical and empirical data. Use of on-site measurements.	Mitigate	Developer/ Consultants
Simulation Model	Overestimation of yield	Medium	High	Low	Use of proven models. Use of conservative P90 values.	Mitigate	Developer/ Consultants
3. Severe Weather Event							
Events	Potential effect	Frequency (event/year)	Severity	Estimated Risk	Mitigation/Strategy	Risk Control Strategy	Risk taker
Lightning Strike	Damage of installation	High	High	Low	Use of technical protection measures	Transfer, Mitigate, Accept	Designer/E PC contractor
Flood		Low	Medium	Medium	Site selection	Transfer, Mitigate,	
Sand storm	Damage of installation /low performance	High	High	High	Use of technical protection measures		
Dune movement	Damage of installation	High	High	Medium	Site selection		
Earthquake		Low	High	Low			

4. Costs Forecast

Events	Potential effect	Frequency (event/year)	Severity	Estimated Risk	Mitigation/Strategy	Risk Control Strategy	Risk taker
CAPEX	Underestimates can lead to lack of funds to complete the project	Medium	High	Low	The cost estimates to be based on recent quotes from the manufacturer/suppliers. Fixed price EPC.	Transfer	Sponsor/EPC/ Contractor
Fixed OPEX	Underestimates can lead to reduced cashflow	Medium	High	Low	The cost estimates to be based on recent quotes from the O&M contractor. Fixed price O&M with escalation built-in into the financial model.	Transfer	Sponsor/O &M contractor
Variable OPEX		Medium	High	Low	The cost estimates to be based on the on-site conditions (dust, wind rain etc.).	Transfer	
Maintenance Reserve Account (inverter replacement)	Underestimates can lead to reduced cashflow	Medium	High	Low	The cost of replacement to be build- in in to the financial model, sufficient MRA to be envisaged in the budget	Transfer	Sponsor

5. Construction Risks

Events	Potential effect	Frequency (event/year)	Severity	Estimated Risk	Mitigation/Strategy	Risk Control Strategy	Risk taker
Cost overrun/ adjustments	Can lead to lack of funds to complete the project	Medium	Medium	Low	Fixed time and budget turnkey contract (Engineering Procurement and Construction Contract (EPC)) Completion Guarantees Monitoring reports Performance reports Penalty clauses Project's budgeted costs will include cost contingency funds	Avoid, Transfer, Mitigate	Manufactur er, EPC Contractor
Equipment Delivery Delays	Delay in completion, loss of revenue, penalty for late completion under PPA	Medium	Medium	Low	Fixed time and budget turnkey contract (Engineering Procurement and Construction Contract (EPC)) Completion Guarantees Monitoring reports Performance reports Penalty clauses	Avoid, Transfer, Mitigate	
Completion delay / Non-completion		Medium	High	Medium			
Transportation Price	Cost overrun	Medium	Medium	Low		Transfer, Mitigate	
Meeting Project specification	Reduced performance	High	Low	Low			

Land availability	Inability to construct the project	Medium	High	Low	Exclusive land lease agreements with the Local Government.	Avoid, Mitigate	
6. Financing risk							
Events	Potential effect	Frequency (event/year)	Severity	Estimated Risk	Mitigation/Strategy	Risk Control Strategy	Risk taker
Interest Rate volatility	Increased interest payments, lowering the DSCR	Medium	Medium	Medium	Fixed rate Hedging financial Covenants	Transfer	Borrower, Lender
Currency	Devaluation of currency in a foreign currency loan will result in reduction of the ability to repay the loan	High	High	High	Hedging Financial Covenants Market Flex PPA	Transfer	Borrower, Lender
Inflation	High inflation can result in increase to increase of the O&M costs	High	Medium	Low	Fixed O&M Hedging	Transfer	O&M contractor
Refinancing Risk	Should the project returns worsen, the refinancing on better rates and conditions would become less attractive	Medium	Medium	Low	Financial Covenants	Accept	Borrower
Violation of Terms	Would result in default	Medium	Very high	Medium	Financial Covenants Insurance	Mitigate, Transfer	Borrower, Insurer
7. Permitting issues							
Events	Potential effect	Frequency (event/year)	Severity	Estimated Risk	Mitigation/Strategy	Risk Control Strategy	Risk taker
Land License/Lease agreement	Inability to construct the project	Medium	Medium	Low	Exclusive land lease agreements with the Local Government.	Avoid, Mitigate	Developer/ Consultants
Connection approval	Inability to distribute the electricity	Medium	High	Low	Exclusive Off-Take agreements with the Bulk Trader and connection agreement with GRID OPERATOR.		Sponsor/ Off-taker
Environmental Approval	The project has high environmental impact	Medium	High	Medium	Use of environmental protection measures		Sponsor

Safety Regulations	The project not able to meet the environmental/ safety regulations	Medium	High	Medium	Use of stringent safety protection measures		Sponsor/O &M contractor
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8. Political Risks / other

Events	Potential effect	Frequency (event/year)	Severity	Estimated Risk	Mitigation/Strategy	Risk Control Strategy	Risk taker
Region Stability	Delay in completion ,loss of revenue.	High	High	High	Political guarantee	Accept, Mitigate	Sponsor/Insurer
Terrorism, unrest, war	Delay or stop of completion, loss of revenue or project	Medium	Extreme	Medium	Use of stringent security protection measures, political guarantee		
Theft, vandalism	Delay in completion, loss of revenue.	Medium	Low	Low	Use of stringent security protection measures. Contribution to local economy	Mitigate	Sponsor/Se curity contractor
Expropriation, nationalisation	Loss of project	Low	Extreme	Low	Project support agreement with the Government, political guarantee. Contribution to local economy.		Sponsor/Insurer
Change of law	Delay or stop of completion or operation, loss of revenue or project	High	High	Medium	Strong political and institutional support from the State Government and from the State energy company		Sponsor
Amendment of terms	Loss of revenue.	Medium	High	Medium			
Enforceabilit y of contracts	Loss of contracts, warranties and guarantees	Medium	Medium	Medium	Use of appropriate legal jurisdiction Contribution to local economy.	Mitigate	

9. Environmental and Social

Events	Potential effect	Frequency (event/year)	Severity	Estimated Risk	Mitigation/Strategy	Risk Control Strategy	Risk taker
Unacceptable environmental impacts	Protected territory, endangered species, pollution etc.	Medium	Low	Low	Full Environmental and Social Impact Assessment ("ESIA") will be performed as a part of the FS&D process. Use of stringent safety protection measures. Environmental Action Plan agreed and prepared.	Avoid, Mitigate	Developer, Designer/E PC contractor
Environmental impact during construction	Pollution to the construction area and surroundings. Destruction of local habitat.	Medium	Low	Low			
Environmental impact of transmission lines construction	Visual impact. Disruption of local habitat.	Low	Low	Low	Full Environmental and Social Impact Assessment ("ESIA") will be performed as a part of the FS&D process.		

Opposition by the local community	Delay in completion, loss of revenue.	High	High	Medium	Social Programme contribution from each project estimated at [] million/yr (/yr) which will be further defined in the FS&D.		Project Sponsor
10. Sponsor Risk							
Events	Potential effect	Frequency (event/year)	Severity	Estimated Risk	Mitigation/Strategy	Risk Control Strategy	Risk taker
Equity and Leverage	Not sufficient equity, high leverage would worsen the DSCR and make the project not attractive to lenders	Low	Very high	Low	The Sponsor commitment to provide sufficient equity and contingent equity	Avoid	Sponsor
Shareholder's structure	Disputes amongst shareholders will make the project not attractive to other financiers	High	High	Low	The Sponsor envisages a simple shareholder structure, where initially 100% of the shares are with the Sponsor, with option of other investors to buy in after financial closure.		Sponsor
Willingness to support	Risk of abandonment	High	Very high	Low	The Sponsor is committed to the project and invests development capital and equity		Sponsor
Corporate governance	Results in inefficient management, PR and compliance issues	High	High	Low	The Sponsor and the operating company are guided by Project Sponsor's corporate governance principles		Sponsor
Project management	Inefficient management, delays and losses	High	High	Low	The project will be managed by professional managers with proven track record and under best management practices		Sponsor, O&M contractor

Risk matrix for the 47 factors

4. CONCLUSIONS:

The risk analysis method presented in this article can be used to evaluate any supply energy entities from renewable sources, useful in order to achieve feasibility study or even to identify possible measures necessary to minimize exposure to certain risks [5].

- risk factor reduction can be accomplished effectively through a variety of measures such as:
 - To achieve very detailed monitoring of intermediary buffers, that requires a control mechanism based on a constrained capacity link.
 - Order's prioritization based on consumption.
 - Signal through color when an order must be created, respectively for the moment in which must enter into a buffer.

5. References:

- 1) <https://www.kapsarc.org/file-download.php?i=7628>
- 2) Oksay, S.; Emre, I. A new energy paradigm for Turkey: A political risk-inclusive cost analysis for sustainable energy. *Energy Policy* **2011**, 39, 2386–2395. [\[CrossRef\]](#)
- 3) Pietrosevoli, L.; Monroy, C.R. The impact of sustainable construction and knowledge management on sustainability goals. A review of the Venezuelan renewable energy sector. *Renew. Sustain. Energy Rev.* **2013**, 27, 683–691. [\[CrossRef\]](#)
- 4) Burgherr, P.; Hirschberg, S. Comparative risk assessment of severe accidents in the energy sector. *Energy Policy* **2014**, 74, S45–S56. [\[CrossRef\]](#)
- 5) https://www.researchgate.net/publication/292678836_Risk_analysis_for_renewable_energy_projects_due_to_constraints_arising

