Critique of offshore wind energy policies of the Denmark and Netherlands—What are the lessons for India

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Namaste from India

- First of all I thanks the organisers of the conference especially Prof. Nien-Tsu Alfred Hu, Ph.D. -Director, Graduate Institute of Marine Affairs Director, The Center for Marine Policy Studies, National Sun Yat-sen University, Kaohsiung, TAIWAN.
- I thank good office of Prof. Nien-Tsu Alfred Hu for giving me this opportunity to travel all the way from Dehradun (India) to such a beautiful land in far east named Taiwan.
- For Indians Taiwan is a country which made rapid stride in economic and human development and we strive to learn from you all.

India – Energy needs

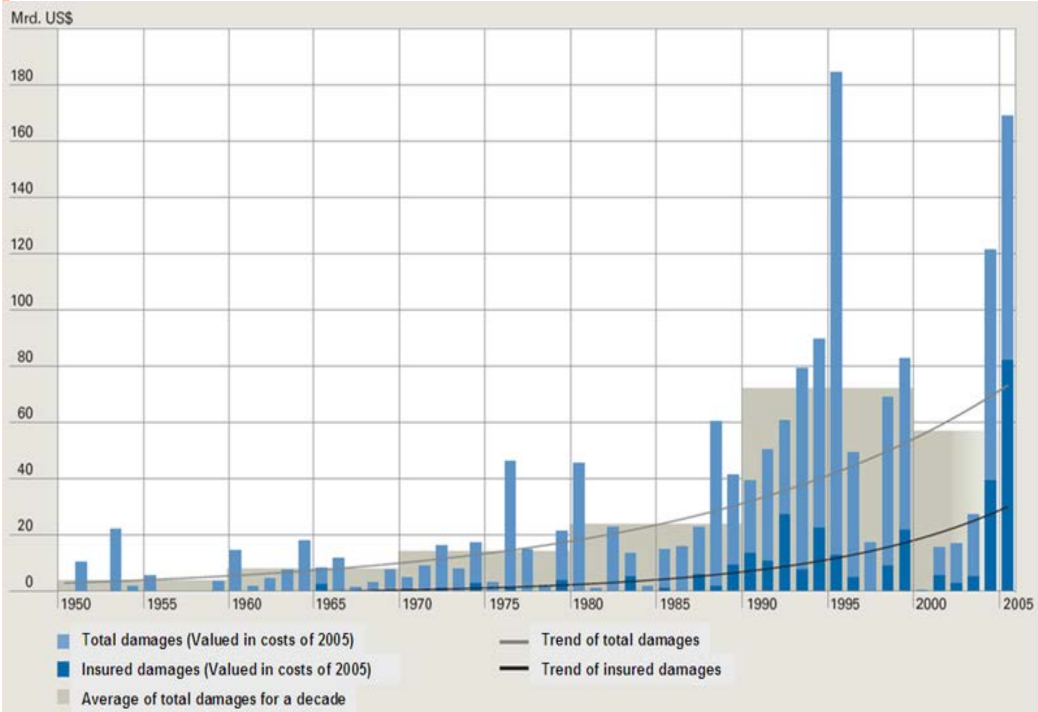
- @ 8% growth – Generation Capacity needed – 962,000 MW in the next 20 years

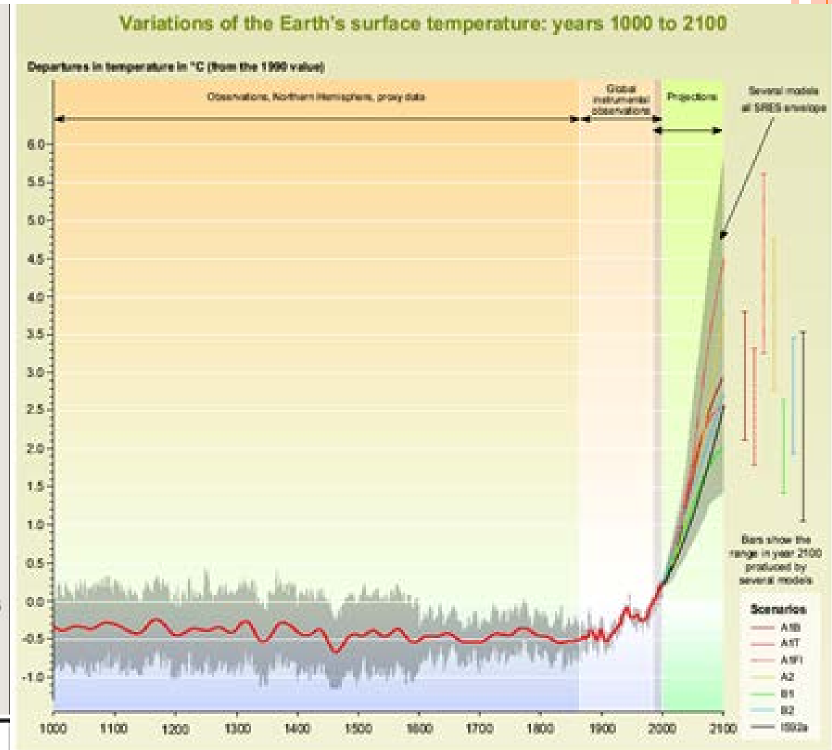
- => Additional 800,000 MW or ~ 750 MW/week from today for the next 20 years.

Year	Billion kWh		Installed Capacity (GW)	
	8%	9%	8%	9%
2006-07	700	700	140	140
2011-12	1029	1077	206	215
2016-17	1511	1657	303	331
2021-22	2221	2550	445	510
2026-27	3263	3923	655	785
2031-32	4793	6036	962	1207

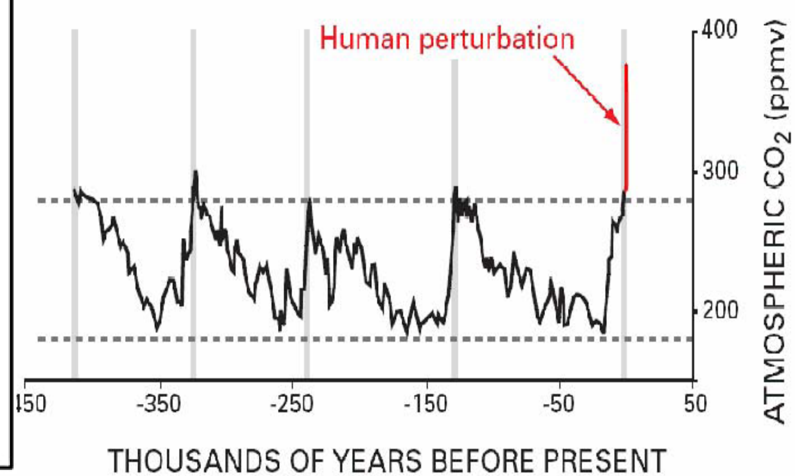
Energy needed @ 8% & 9 % GDP growth

Effect of fossil fuels on environment

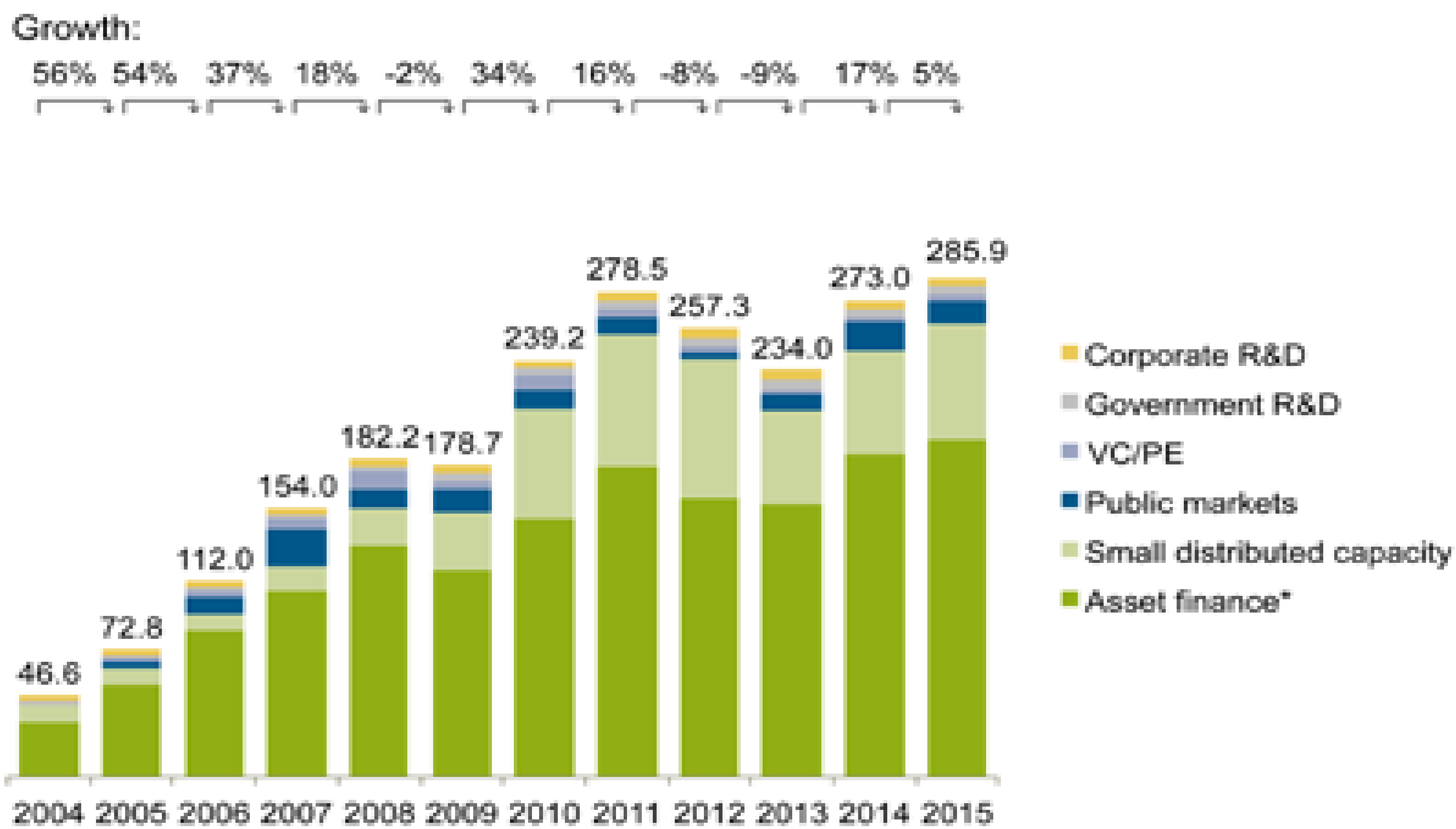




Carbon Dioxide Emissions (t/GWh)	
Coal	964
Oil	726
Gas	484
Nuclear	8
Wind	7
Photovoltaic	5
Large Hydro	4



GLOBAL NEW INVESTMENT IN RENEWABLE ENERGY BY ASSET CLASS, 2004-2015, $BN



- Source- UNEP, Bloomberg, 2016

Renewable Energy achievements & potential - India

	Achieved		In Process	Anticipated	Targets	Estimated Potential
Five –Year Plan	Cumulative Installed Capacity by the end of 9th Plan	10th Plan – additions during the plan period	Anticipated in the 11th plan (additions during the plan)	By the end of the 11th plan (Cumulative installed capacity)	By the end of the 13th plan (cumulative installed capacity)	Medium Term
Years	Through 2002	2002-2007	2007-12	Through 2012	Through 2022	10 Years
Wind	1667	5415	10,500	17,582	40,000	102,000
Small Hydro	1438	520	1400	3358	6500	15,000
Biomass	368	750	2100	3218	7500	23,700
Solar	2	1	1000	1003	20,000	20-30 MW/Sq. Km
Total	**3,475**	**6,686**	**15,000**	**25,161**	**74,000**	**~ 150,000**

Source: MNRE

Country specific potential of Onshore and Offshore wind energy

Country	Onshore (GW)	Offshore (GW)	Onshore (TWh)	Offshore (TWh)
Russia	54,794	10,502	120,000	23,000
Canada	35,616	9,589	78,000	21,000
US	33,789	6,392	74,000	14,000
China	17,808	2,100	39,000	4,600
UK	2,009	2,831	4,400	6,200
Germany	1,461	429	3,200	940
India	1,324	502	2,900	1,100
Japan	260	1,232	570	2,700
S.Korea	59	452	130	990
Italy	114	73	250	160

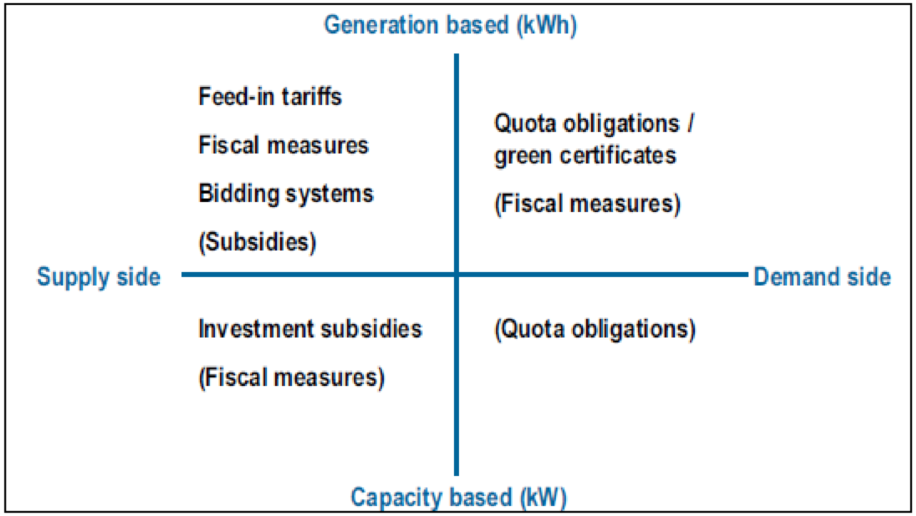
Source: Xi Lu et al., and Lawrence Berkeley National Laboratory, US

Challenges with onshore Wind Energy

- Lack of availability of contiguous parcels of land
- Unpredictable nature of wind sources on land
- Potential land litigations
- 'Food vs. fuel' debates if arable land is taken over for onshore wind farms
- Issues of visual impact and noise
- Most of the potential sites already taken (Repowering ?)

Literature review

- World has witnessed various policies to promote wind power. Here an attempt has been made to summarise various policy mix which helps in creating a clear picture of policies landscape. This set actually helps other countries who are not high on promoting wind power to help world move from fossils fuels to renewables.
- Typical Policy measures to promote wind energy -*Vries, 2003*



Literature review

S.No	Themes	Select Author(s)	Context	Inferences
1	Offshore wind energy status in Europe	EWEA (2012), REN 21, (2012), Moller (2011).	Europe	Offshore wind energy has reached almost 4000 MW of installed capacity today with close to 6000 MW likely to be commissioned by end of 2012 with UK being the leader followed by Denmark, Netherlands and Germany.
2	Policies adopted by countries in Europe for the offshore Wind energy sector	(Green & Vasilakos, 2011), (Esteban et al., 2011), Lewis & Wiser (2007), Luthi & Prasseler (2011), Dinica (2006), Huber (2004), Held (2006), Ragwitz (2006), Mitchell (2006), Toke (2011), Sperling (2010), Prassler & Schaechtele (2012), Buen, 2007; kaldellis (2011).	Europe	Talks about how having a consistent and cogent policy have helped grow the offshore wind energy sector in Europe.

LITERATURE REVIEW

3	**Possible Challenges to growth of offshore wind sector**	**Krohn et al.,(2009), Swider et al., (2008), (Green & Vasilakos, 2011), (EEA, 2009), (Blanco,2009), (Markard & Petersen, 2009)**	**Europe**	**High electricity costs, grid connectivity, foundation costs, environmental clearances, multiple agencies to obtain clearances, water depth, distance to the coast, O&M costs are all some of the challenges faced in offshore wind energy sector .**
4	Factors that aided the growth of offshore	Prassler & Schaechtele (2012), (Bergek & Jacobsson, 2003), Foxon et al. (2005), (Wolsink, 2000), (Warren et al., 2005), Aitken (2010), (Warren et al., 2005), (Krohn, 2009)		How permit procedures, grid connectivity, public support and environmental clearances are critical factors in growth of offshore. Also different policies need to be adopted for different stages in the evolution of offshore wind sector.

LITERATURE REVIEW

5	Stability of policies for long term helped growth of wind energy	(Boyle, 2007)	Europe	Adoption of a specific target and keeping it for long term

Review suggests that authors have agreement in the following areas like offshore wind energy has seen massive installation in these four countries UK being the leader followed by Denmark, Netherlands and Germany, consistent and cogent policy have helped it to grow.

Following superset of variables, as shown in next slide, was found from the literature survey that formed the building blocks of offshore wind energy policy roadmap adopted by countries around the world most importantly the UK, Germany, Denmark and the Netherlands..

Building blocks of policy mix-all variables

SNo.	Components/Building Blocks/Variables
1	Feed in Tariffs (FiT)
2	Accelerated Depreciation
3	Generation based Incentives (GBI)
4	Legally enforceable RPO/REC
5	Faster approvals/Single Window Clearance
6	Continuity of policies for long term (more than 10 years)
7	Adequate evacuation infrastructure to transmit power from high seas
8	Tariff determination on wind speeds and not on Zones
9	Financial incentives like zero import duty, excise duty waiver
10	Availability of expert EPC contractors
11	Availability of local manufacturing expertise for Wind Turbine
12	Growth of ancillary units (eg Gear box)
13	Superior program execution skills of the developer
14	Accurate data on offshore wind potential sites and wind speeds
15	Skills development and training of human resources
16	Active Research institutions working on offshore wind energy
17	R&D facilities to localize production of expensive equipments
18	'Priority sector' tag to offshore wind energy sector
19	Availability of capital at attractive rates of interest
20	Creation of offshore wind energy fund to reduce cost of capital
21	Moratorium on interest payments for the first 5 years of project go-live

Building blocks of policy mix-all variables

- No one country has adopted all the factors but have picked a smaller set that probably suited their local conditions.
- **Discussions**- The review of the offshore wind energy policies adopted by the Denmark and Netherland are discussed.
- Denmark published its first renewable energy policy following the oil crisis which focused on creating entrepreneurs at the ground level and formation of cooperatives to boost the growth of renewable energy (DEA, 2007).
- Feed-in tariffs, agreements with the utilities to support decentralised power generation in 1979, has since accelerated the growth of wind energy in the country. Denmark announced its offshore wind energy policy in 1996 and had a target of 4000 MW of generation from offshore wind by 2030 (DEA, 2007).

REVIEW OF THE OFFSHORE WIND ENERGY POLICIES OF DENMARK

- Denmark has been a pioneer of exploiting wind energy for more than 2 decades which has resulted in one of the highest wind power penetration levels in the world, close to 25-30 %.
- **Consent Procedures-** Danish Energy Authority (DEA) acts as the single window agency for consent–sites—tender—award—negotiation—permit—assessment-- complete application with the EIA—License
- *Figure 1.2 - Flowchart of the consent procedure in Denmark*
- **Grid Connectivity-** TSO– If through a tender-- guaranteed financial compensation if the TSO is unable – If open door route then the responsibility lies with developer.

REVIEW OF THE OFFSHORE WIND ENERGY POLICIES OF DENMARK

- **Financial Incentives-** turbines connected to the grid – premium and incentives– income tax rebate for Cooperative owned wind turbines to diversify ownership.
- Offshore wind farm projects happened with tendering and negotiated tariff way.
- **Impact of these policy initiatives-** *Single Window Clearance(state)-Tendering policy- Environment assessment-- Grid Connectivity(state)*
- only downside is not adopting tradable green certificates mechanism to give the project developers a premium on the power generated and instead adopting the steady, albeit lower revenue generating mechanism of feed-in – tariffs.
- Summary- Nevertheless, Denmark has one of the most progressive policy initiatives to encourage the growth of offshore wind energy sector in their country.

Review of the Offshore Wind Energy Policies of Netherland

- Netherlands has had definite R&D programs and policies to support innovation in wind turbine manufacturing, since 1976, which led to the growth of production of wind turbines in the country.
- Investment subsidies granted in 1988– changes to generation based incentive -- mandated grid access to wind energy farms-- target of 14% of electricity from renewable by 2020-- 6000 MW each from offshore and onshore
- **Consent Procedures-** Public works and water management act (WBR)-- key legislation -- An Environmental impact assessment must be submitted along with the application—
- *Figure 1.3 - Flowchart of the consent procedure for offshore wind parks in Netherlands*

REVIEW OF THE OFFSHORE WIND ENERGY POLICIES OF NETHERLAND

- **Grid Connectivity-** TenneT is the onshore grid owner and regulator. The developer pay for cabling and offshore grid infrastructure-- wind farm developers have to make an application to build the offshore grid to Tenne T -- Netherlands has a highly evolved grid infrastructure in place -- several plans by TenneT to have inter-country grids in place with other EU countries like Germany, Norway and Denmark (DTI, 2011)
- **Financial Incentives-** Initially subsidy on KW capacity -- lead to over-dimensioning of projects to get higher incentives-- changed to generation based incentive– Approved projects participated in tender process for subsidy offered for fifteen years subject to several conditions--

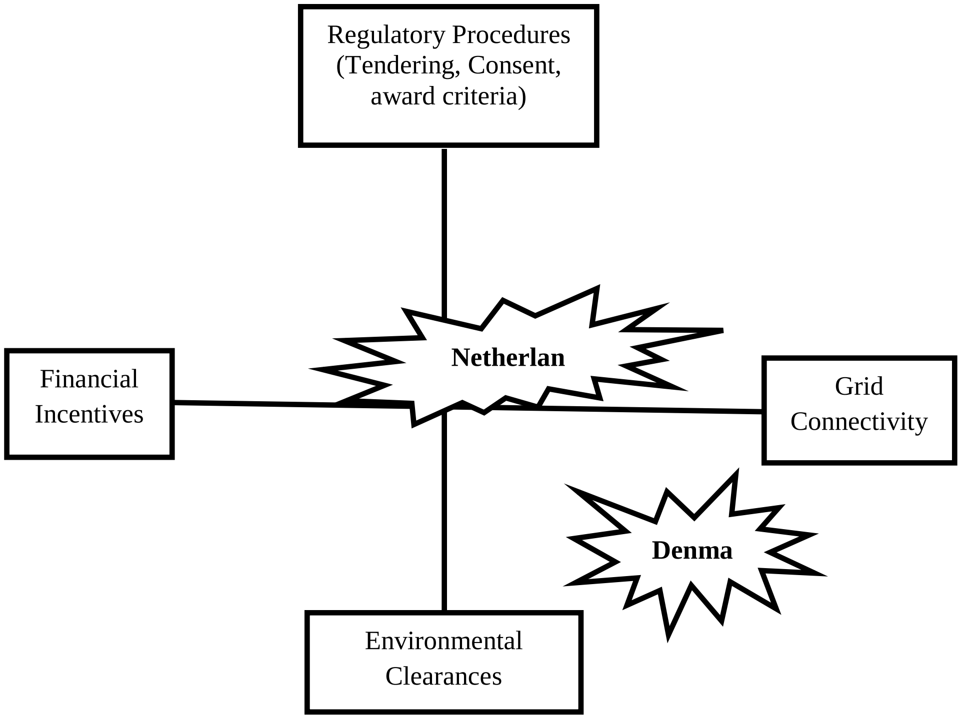
Review of the Offshore Wind Energy Policies of Netherland

- The subsidy helps to bridge the gap between the electricity floor price and the tariff value.
- If the existing rate is below the floor price, the developer gets a sum of floor price and subsidy which may be less than the tariff value. If the existing rates is more than the tariff value, then the developer get the existing rates but no subsidy.
- feed-in tariff bonus by distance from shore to the offshore wind park-- maximum subsidy for 3180 hours of production (80%)-- project should begin within 5 years of subsidy-- innovation grants
- **Impact of these policies initiatives**– EIA (developer) -- grid connection expenses (developer) – More clarity for long term

Review of the Offshore Wind Energy Policies of Netherland

- **Summary-** evacuation infrastructure and environmental clearances by developer. Additional tariff , liberal time frame and easy depreciation norms new positives.
- *Comparison of Offshore Wind Energy policies adopted by select European countries (Denmark, Netherlands)*
- Perceptual map of attractiveness for offshore wind sector

Perceptual map of attractiveness for offshore wind sector in Denmark and netherland



Recommendations for india

Offshore wind energy policy recommendations for India (1/2)

Facility	Description
'Single Window Clearance' procedure	UK has a 'one stop shop' procedure to ease the procedural difficulties for project developers. Denmark, Germany also have a one-stop procedure.
Transparency in financial burden for project developer	The fee, lease, administrative charges etc. need to known to developers in advance so that there are no surprises while executing the project
Securing pioneering risks	Both fixed feed-in tariffs and renewable energy certificates, implemented in a secured environment, have been shown to attract the required investments when combined with legally enforceable purchase contracts for typically 15 to 20 years. India needs to adopt these inducements to motivate developers to look at offshore wind energy
Risk hedging schemes	Offshore wind energy projects, at least during the initial stages, are risky in India as these are new technologies. Developers will face challenges to get Insurance cover on their own, especially from private insurance agencies. For the first 'wave' of developments, the public sector insurance companies (with overt support from the Government) could play an important role
Anti-speculation clauses	Imposing deadlines – accompanied with penalties or loss of the concession – for follow-up action, for instance by requiring that the developer start building activities within a limited period of time after the required permissions have been granted. This will ensure that there are no 'squatters' on potential wind farms sites as seen even in onshore wind energy

Offshore wind energy policy recommendations for India (2/2)

Facility	Description
Sprinter bonus for project completion	Bonus for early completion and commissioning of offshore wind farms needs to be included to incentivize developers to accelerate completion of projects. Currently, in EU, there's a penalty for delay in completion but no bonus for completing work ahead of schedule. Since 'Risk' and 'Reward' go together, policy makers need to announce sprinter bonus for developers
Automatic Environmental clearances before inviting bids	Environmental clearances significantly delay many infrastructure projects in the country. Hence the Government need to accord environmental clearances to the proposed project sites even before inviting bids from interested developers
Accurate data to predict the offshore wind energy potential	Currently, accurate data on offshore wind energy potential in the country is unavailable. Wind energy potential in a site is an important parameter for obtaining funding from financial institutions for a project developer. Hence efforts should be made to obtain accurate data
Building evacuation infrastructure by Government	Important, and probably as expensive, in an offshore wind energy project is to develop evacuation infrastructure from the seas to the grid onshore. As this will be prohibitive for any developer, Government could consider building the evacuation infrastructure to encourage growth of offshore wind energy sector
Legally enforceable payment mechanism	Poor financial health of most of the State Electricity boards (SEBs) delays in realizing payment (that run into several million US dollars) will adversely affect the working capital and cash flows of project developers forcing them to take additional loans at high interest to keep the business going. Hence, legally enforceable payment mechanism needs to be put in place to give confidence to investors and project developers

SUPPORT OF POLICIES IN THE GROWTH OF ONSHORE WIND ENERGY SECTOR IN INDIA

- Electricity Act 2003 was a watershed policy
- The act also mandated RPO, growth in renewable,
- Subsequent policies that followed the Electricity act 2003 like the National Electricity policy (encouraging private sector competition), National Tariff policy (preferential tariff for wind energy), Accelerated depreciation, tax subsidies, duty waivers, generation based incentives etc. apart from state specific policies .
- Dedicated cabinet level nodal ministry (MNRE)

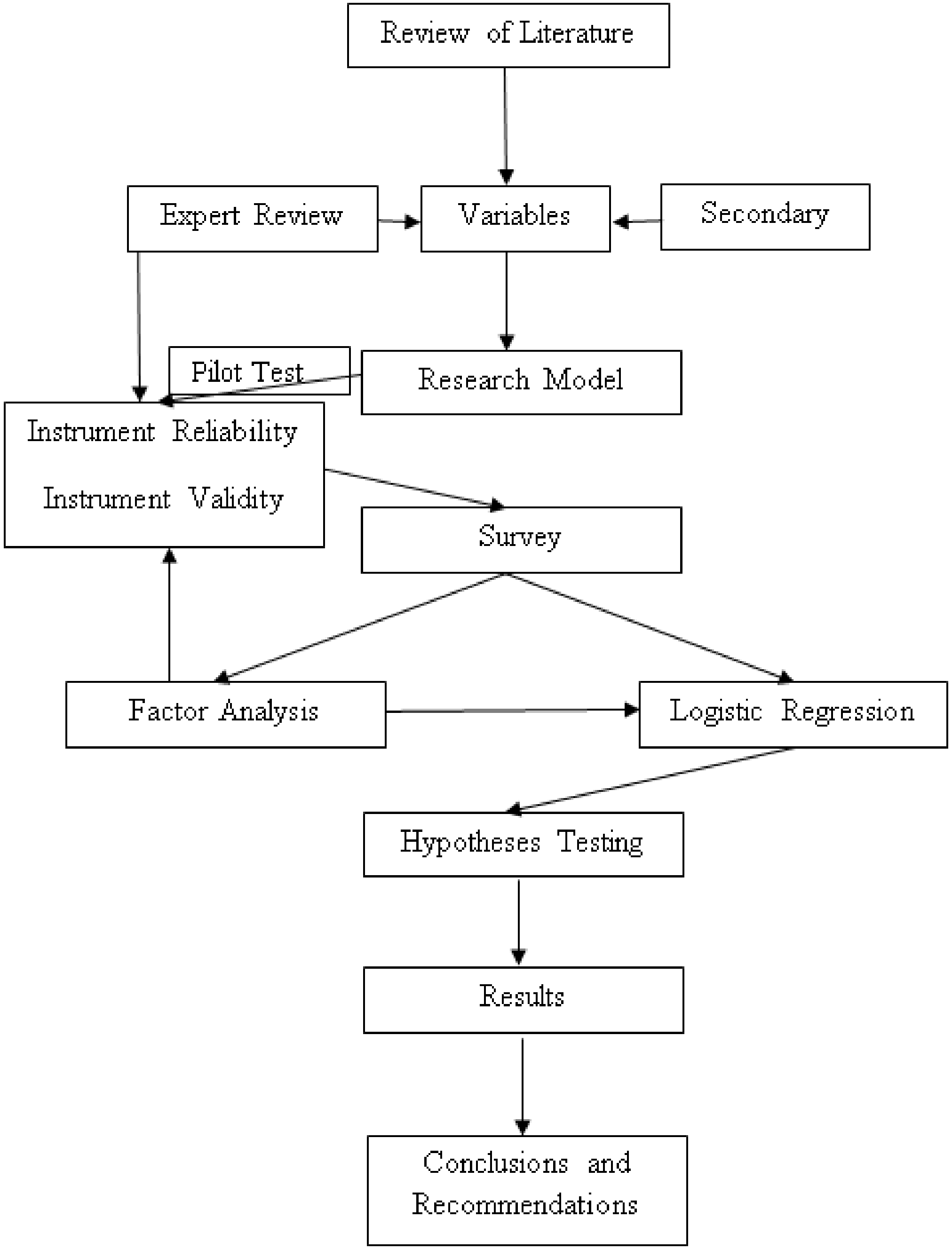
CONCLUDING REMARKS

- Europe is a pioneer and the world leader in offshore wind energy sector as of today. Each of the countries reviewed have their own policies to support this sector and they vary considerably from country to country.
- Tender based system is being pursued by Denmark & Netherland.
- Apart from the financial support, several other factors like grid connectivity, continuity of policies for the long term, award criteria, visibility into future project pipeline and host of other factors come together to make a country attractive for offshore wind farm .
- There is a direct relationship between supportive policies and growth of renewable in India. Supportive policies for offshore wind energy will give the necessary impetus to promote the sector in India.
-

Discussion points by my own research

- Building blocks of offshore wind policy
- 5 levers that emerge – Factor analysis
- 3 High impact levers – Logistic regression
- Conclusion and recommendation

Research Methodology Flowchart



Building Blocks of Offshore Wind Energy Policy

SNo.	Components/Building Blocks/
1	Feed in Tariffs (FiT)
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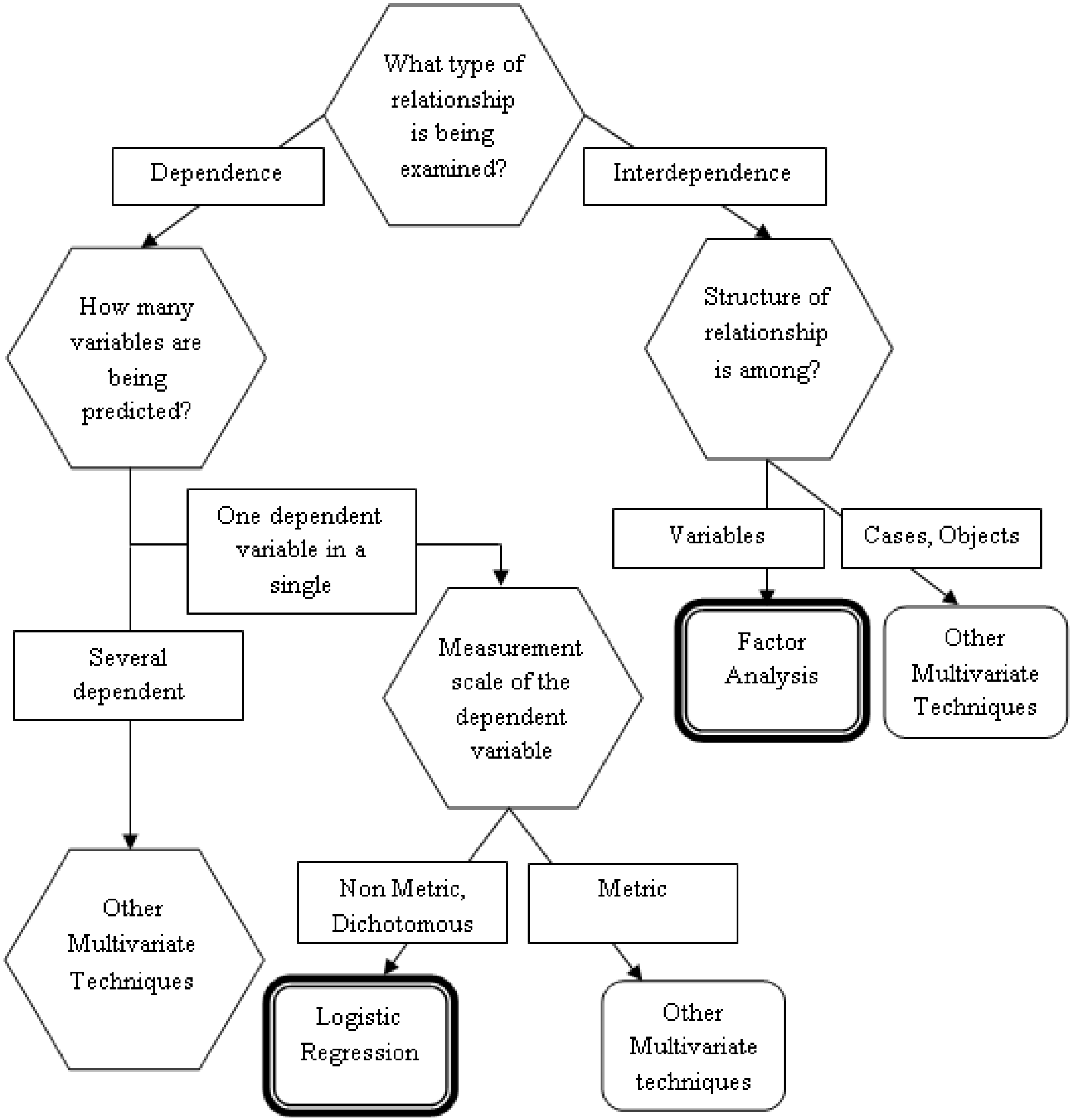
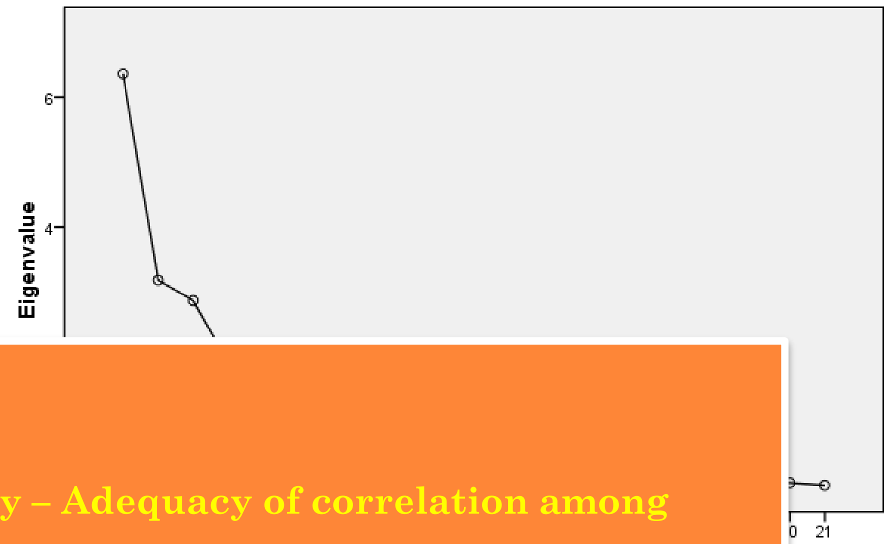
FLOWCHART FOR SELECTING A MULTIVARIATE TECHNIQUE



FACTOR ANALYSIS

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.726
Bartlett's Test of Sphericity	Approx. Chi-Square	3197.603
	df	210
	Sig.	.000

Scree Plot



Result:

KMO of 0.726 - Measure of Sampling adequacy – Adequacy of correlation among variables to be eligible for factor analysis.

Bartlett's Test – Verifies the null hypothesis that the variables are independent of each other – rejects

5 factors extracted (Scree plot) and (Rotated Component Matrix) - no cross loading. All variables load cleanly on one factor.

Faster_Appr					
Policy_for_lo					
Tariff_based speeds					
Grid_connec					
Financial_In					
Priority_secto					
Capital_at_a rates					
Moratorium_ payment					
Offshore_win					
Access_to_c					
Superior_pro execution					
Expert_EPC_Contractors			.836		
Growth_of_ancillary_unit			.770		
Local_manufacturing			.741		
AD				.803	
GBI				.797	
FiT				.668	
RPO				.580	
Skill_development					.864
Accurate_offshore_wind_ speeds					.827
RD_Ecosystem					.745

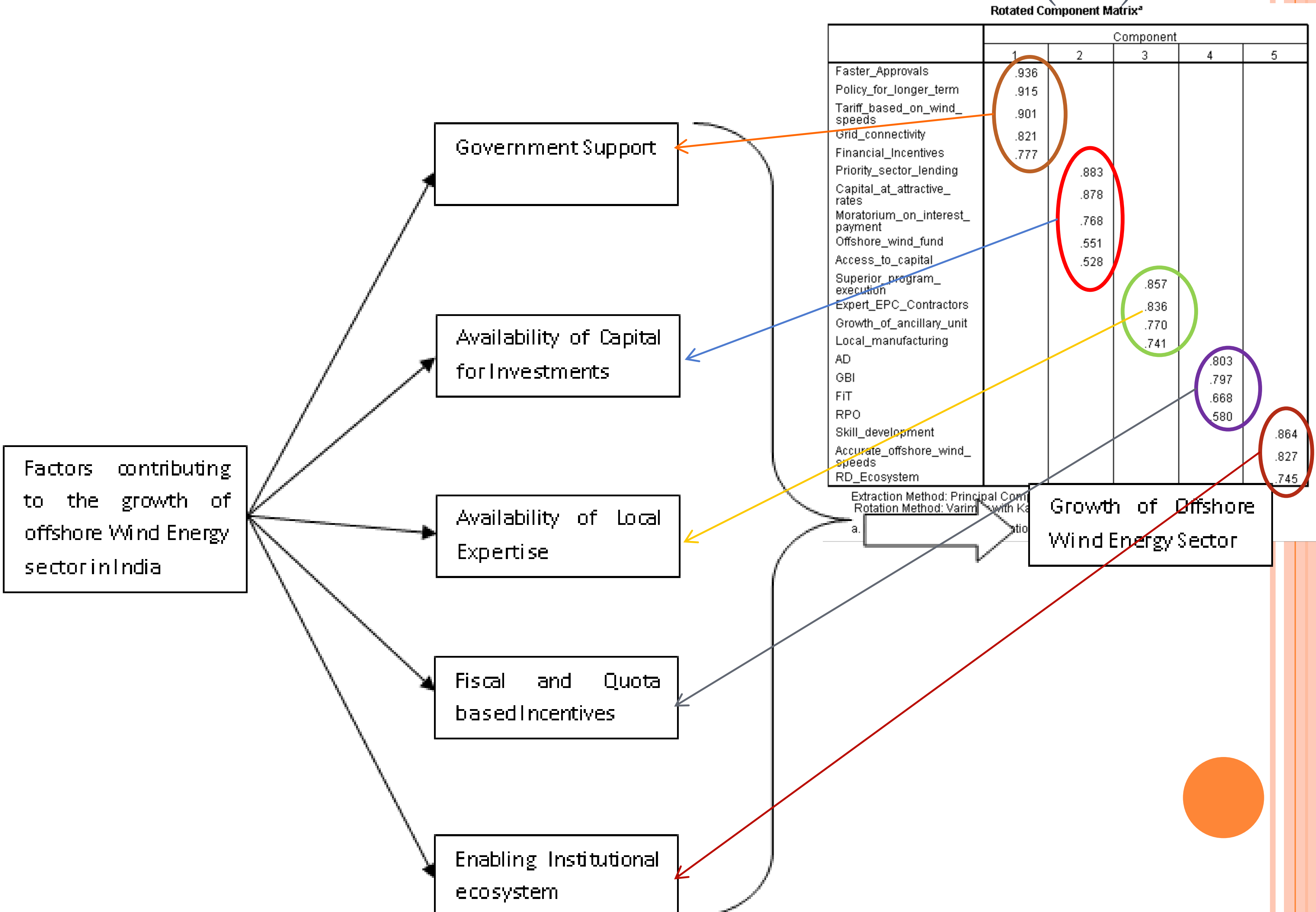
Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 6 iterations.

									...adings
									...mulative %
									20.599
									34.576
									47.920
									61.082
									73.507
7	.809	3.850	81.987						
8	.676	3.220	85.207						
9	.528	2.515	87.722						
10	.459	2.185	89.907						
11	.411	1.957	91.864						
12	.379	1.805	93.669						
13	.281	1.337	95.006						
14	.270	1.285	96.291						
15	.208	.992	97.284						
16	.157	.747	98.031						
17	.145	.690	98.721						
18	.099	.472	99.192						
19	.095	.451	99.644						
20	.057	.270	99.914						
21	.018	.086	100.000						

Extraction Method: Principal Component Analysis.

Building Blocks – Offshore Wind Policy (1/3)



	Component 1	2	3	4	5
Faster_Approvals	.936				
Policy_for_longer_term	.915				
Tariff_based_on_wind_speeds	.901				
Grid_connectivity	.821				
Financial_Incentives	.777				
Priority_sector_lending		.883			
Capital_at_attractive_rates		.878			
Moratorium_on_interest_payment		.768			
Offshore_wind_fund		.551			
Access_to_capital		.528			
Superior_program_execution			.857		
Expert_EPC_Contractors			.836		
Growth_of_ancillary_unit			.770		
Local_manufacturing			.741		
AD				.803	
GBI				.797	
FiT				.668	
RPO				580	
Skill_development					.864
Accurate_offshore_wind_speeds					.827
RD_Ecosystem					.745

Building Blocks – Offshore Wind Policy (2/3)

- **Government Support**
  - Faster approvals and Single window clearance mechanisms
  - Sustainability of policies environment for a longer term (10 years or more)
  - Constructing evacuation Infrastructure and facilities for storage of electricity grid
  - Zero duty on imports, excise duty waiver and tax benefits for offshore wind ener

Rotated Component Matrix[a]

	Component				
	1	2	3	4	5
Q10	.936				
Q12	.915				
Q14	.901				
Q11	.821				
Q13	.777				
Q26		.883			
Q22		.878			
Q23		.768			
Q24		.551			
Q25		.528			
Q18			.857		
Q15			.836		
Q17			.770		
Q16			.741		
Q7				.803	
Q8				.797	
Q6				.668	
Q9				.580	
Q20					.864
Q19					.827
Q21					.745

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 6 iterations.

- **Availability of capital for Investments**
  - Availability of capital at attractive rates of interest similar to what is extended to priority sector projects
  - Moratorium on interest payments for the first few years of project go-live.
  - Offshore wind energy fund from cess levied on carbon emissions or a Government backed guarantee to reduce the cost of capital
  - Financial Institutions willing to lend to offshore wind projects as priority sector

Building Blocks – Offshore Wind Policy

- Availability of local expertise
  - Expertise and availability of EPC contractors for commissioning of the wind far
  - Manufacture and availability of offshore wind energy components, locally
  - Growth of ancillary units
  - Superior program execution skills and capabilities

Rotated Component Matrix[a]

	Component				
	1	2	3	4	5
Q10	.936				
Q12	.915				
Q14	.901				
Q11	.821				
Q13	.777				
Q26		.883			
Q22		.878			
Q23		.768			
Q24		.551			
Q25		.528			
Q18			.857		
Q15			.836		
Q17			.770		
Q16			.741		
Q7				.80[illegible]	
Q8				.797	
Q6				.668	
Q9				.580	
Q20					.864
Q19					.827
Q21					.745

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 6 iterations.

- Fiscal and Quota based incentives
  - Feed –in Tariff (Higher tariff for offshore wind vis-a'-vis other renewable)
  - Accelerated depreciation, Generation based incentives (GBI)
  - Enforcement of Renewable purchase obligations (RPO)/Renewable energy certificates (REC)

- Enabling Institutional (R&D) ecosystem
  - Research institutions to build accurate data on offshore wind potential sites and wind speeds (Wind Resource map and Bathymetric data)
  - Skills development and training of the human capital on offshore wind systems
  - R&D to localize production of expensive equipment to bring the overall costs down

Logistic Regression (1/2)

Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	181	100.0
	Missing Cases	0	.0
	Total	181	100.0
Uns			
Tota			

a.

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	FAC1_1	33.030	1	.000
		FAC2_1	.313	1	.576
		FAC3_1	.377	1	.539
					00
					00
					00

Result:

Block 0 presents the results with only the constant included before any coefficients are entered into the equation

Independent Variables - Factors 1, 4 and 5 - improves the model significantly

Block 1 Method = Enter. This presents the results when the predictors

Chi-square 167.903 (> -2LL of 37.293) and Sig <.05 => that the predictors do have a significant effect and create essentially a different model.

Nagelkerke's R2 of .891 indicating a strong relationship of 89.1% between the predictors and the prediction

H-L (.905) => model suggested is a good fitting model

Step 0	Constant	1.077	.171	39.769	1	.000	2.935

a. Estimation terminated at iteration number 8 because parameter estimates changed by less than .001.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	3.426	8	.905

Logistic Regression (2/2)

Classification Table[a]

Observed			Predicted Growth 0	Predicted Growth 1	Predicted Percentage Correct
Step 1	Growth	0	42	4	91.3
		1	3	132	97.8
	Overall Percentage				96.1

Overall 96.1% were correctly classified. This is a considerable improvement on the 74.6% correct classification with the constant model so we know that the model with predictors is a significantly better mode

Logistic Regression equation that gives the growth of offshore wind energy in India will be

Log (p/1-p) = 3.695 + 3.168 x F1 + 0.573 x F2 + 0.340 x F3 + 3.337 x F4 + 2.510 * F5

Government Support, Fiscal & Quota based incentives and ***enabling institutional ecosystem*** have high impact on the growth of offshore wind energy in India

```
                                                                                                     1+
                                                                                                     1|
                                                                                                     1|
                                                                                                     1|
                                                                                                     1+
                                                                                                     1|
                                                                                                     1|
 U                                                                                               1   1|
 E     20 +                                                                                      1   1+
 N        |                                                                                      1   1|
 C        |                                                                                      1   1|
 Y        |                                                                                 1   11   1|
       10 +                                                                                 1   11   1+
          |                                                                             1   01 111   1|
          |          0 0  00       10  0    1000  1      1   0              1    1 1  10 1 1 1101 11111 1|
          |          0 0  00       10  0    1000  1      1   0              1    1 1  10 1 1 1101 11111 1|
 Predicted ---------+---------+---------+---------+---------+---------+---------+---------+---------+----------
   Prob:   0        .1        .2        .3        .4        .5        .6        .7        .8        .9         1
   Group:  000000000000000000000000000000000000000000000000011111111111111111111111111111111111111111111111111

           Predicted Probability is of Membership for 1.00
           The Cut Value is .50
           Symbols: 0 - .00
                    1 - 1.00
           Each Symbol Represents 2.5 Cases.
```

SNo.	Components/Building Blocks/Variables
1	Feed in Tariffs (FiT)
2	Accelerated Depreciation
3	Generation based Incentives (GBI)
4	Legally enforceable RPO/REC
5	Faster approvals/Single Window Clearance
6	Continuity of policies for long term (more than 10 years)
7	Adequate evacuation infrastructure to transmit power from high seas
8	Tariff determination on wind speeds and not on Zones
9	Financial incentives like zero import duty, excise duty waiver
10	Availability of expert EPC contractors
11	Availability of local manufacturing expertise for Wind Turbine
12	Growth of ancillary units (eg Gear box)
13	Superior program execution skills of the developer
14	Accurate data on offshore wind potential sites and wind speeds
15	Skills development and training of human resources
16	Active Research institutions working on offshore wind energy
17	R&D facilities to localize production of expensive equipments
18	'Priority sector' tag to offshore wind energy sector
19	Availability of capital at attractive rates of interest
20	Creation of offshore wind energy fund to reduce cost of capital
21	Moratorium on interest payments for the first 5 years of project go-live

Fiscal & Quota based incentives (1–4)

Government Support (5–9)

enabling institutional ecosystem (14–16)

Best of breed Offshore wind policy from Europe

Key Factor	UK	Germany	Denmark	Netherland
Government plans for expansion of offshore wind energy	Ambitious and very specific plans for new capacity launched through successive tender rounds	Strategic, long-term ambition for offshore wind capacity. (10 GW by 2020 and 25 GW by '30)	Specific but modest target or plans for expansion	Initially ambitious plans but several postponements and delays
Tender model	Multisite tender rounds State appoints zones-investor finds and proposes sites within these zones	Open-door procedure Investor finds and proposes sites	Single site auction State defines site Limited dialogue with tenderers	Multisite / open selection auction Investor finds and proposes sites
Award Criteria	Call for tender after negotiation Based on developer's project proposal and capacity	First come, first served Permission to be achieved for site in advance	Lowest offered tariff	Lowest offered tariff. Prequalification done and who pass the stage are called for negotiation
Time frames for use/ establishment	Fixed but enough headroom	Flexible and spacious	Fixed and tight (establishment to be completed 2-3years from awarding)	Fixed, but moderate (construction to be initiated before 3 years from award)
EIA	Performed in continuation of tender round. Financing is split between state and investor	Performed along with application Financed by investor	Performed before call for tenders Financed by state	Performed before auction Financed by investor

Key Factor	UK	Germany	Denmark	Netherland
Subsidy settlement for sale of electricity	Renewable obligation certificates(ROC) on top of the price of electricity(until 2037) Extra credits for offshore wind	Fixed, uniform tariff (at least12 years ahead). Additional tariff for OWF till 2016 Extension of subsidy period on great distance to shore and depth	Fixed tariff price defined by winning tender(10-15 years ahead)	Fixed tariff defined by winning tender(15 years ahead) Addition for distance to shore Ceiling to total subsidized production
Supplemental incentives (penalty, sprinter bonus, etc.)	Exemption of electricity buyers of Climate Change Levy Lease payment for sites	Sprinter tariff over and above additional tariff for OWF (declining on taking into operation after2015)	Keep-open penalty Delay penalties	Easy depreciation rules for investments Keep-open penalty. Bank Guarantee to be revoked incase of delays Innovation bonus
Grid connection	Investor is in charge of and negotiates the cost of grid connection with network operator	Grid connection costs borne by the TSO – based on developer meeting conditions	Free connection; state performs, finances and guarantees	Investor bears expenses of grid connection. Plans to get the TSOs bear the cost.
Regulatory procedures and planning	Individual permission procedures ,multiple approvals needed. (Almost single window)	Approval by regional state agencies, some by Federal (Almost single window)	Streamlined one-stop shop	Not one-stop shop

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