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Installation of Distributed Generation units to support the Grid

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Abstract

Distributed generations (DG's) has decreased transmission, good power quality, distribution resource, increased reliability. Because of changes in the electricity supply demand, the small generations distributed in the low or medium voltage network has significant importance. This paper may focus on the most important research area related to Distributed generations. This paper highlights solar, wind, Biomass power plants and installation of DG units at different places to install a new renewable energy based DG to support Grid.

Key words: Distributed Generations, Solar, wind, Biomass power, DG units at different places.

1 Introduction

Integrated DG indicates generation of small units which is directly connected to a distribution system. The power is generated and sometimes shared & connected to grid, it is termed as DG. In power system network, DG systems are directly connected to the voltage range of 440KV or 11KV at the consumer end of power system or distribution system [1]. The advantages of integration of DG's are improvement in voltage profile, reduction in line losses, reliability, and improvement of power quality [9].

The distributed generation is based on the different types of energy sources used for the generation of power. Generation of power is mainly by using renewable energy sources. DG's are innovation based sustainable power sources, for example, sun based, wind, Bio-mass, and Tidal and so forth.

The demand of the electricity increasing, hence existing system is not enough to meet the demand of electricity. This can be reached by using RES based DG integration [2].

The DG system is meant to provide power in cost effective manner to the consumers. Conventional distribution system planning establishes strategies such as expanding existing system to meet the increasing load demand. Due to increasing fuel prices & environmental concerns has development of incorporate DG in distribution system planning.

2 RES Based DG integration

The integration of renewable based wind and solar PV generation in distribution systems are needed to reach the demand. In the present scenario, distributed System required the efficient and robust planning for smooth operation of the system. Size of DG's will vary from few KVA to MVA. By methods for these frameworks, customers may build up their very own generation and supply their energy needs.

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2.1 Solar Energy System

Sun based energy can be utilized for generating power. In Solar power generation, light from sun is changed over into electrical energy through photo voltaic cells utilized in the construction of solar based panels [9]. This sun oriented power makes no damage to environment. The total grid connected solar capacity has reached about 5547.21MW.

The PV installation at Karnataka is about 2986MW in terms of grid connected renewable based power & 2300 thousand sqm of solar water heating systems and there are 4200 MW plants installed 2014-15. And government is planning to install 25,000 solar rooftops systems of 5-10kwp capacity by 2016.

As per Ministry of New & Renewable energy government of India (MNRE) have setting up of 1100MW grid connected solar plants, including 100MW capacity plants. In Karnataka, 14MW of PV interconnected to the grid with voltage rating from 11KV to 66KV.

Solar grid connected power projects against a target of 1000MW, a total of 970MW capacity 2015 and also scheme for setting up of 2000MW. The Solar power plant is intended for interconnection with the pooling substation at sunlight based park, substation as pertinent through committed transmission line/link at voltage level of 33KV or more, at 2015. Grid connected solar power projects from 20000MW by the year 2021-22 to 100000MW, year wise targets to be achieved to accomplish target of 100000MW.

2.2 Wind Energy System

It is one of the best alternatives for power generation. Due to its availability it is one of the important RE based source. The installed capacity is about 28082.95MW.

The wind installation at Karnataka is about 12950MW & in India 14989MW. The new plan is to integrate additional 6000MW of wind in to grid during 2012-2017. The potential for grid connection is 14GW & 139GW, wind projects with capacity of 2.10GW as per 2014, MNRE report.

Total capacity of 22,465 MW has been built up to December, 2014, for the most part in Tamil Nadu, Gujarat, Maharashtra, Andhra Pradesh, Karnataka and Rajasthan. Wind electric generators of unit measures between 225 kW and 2.1 MW have been sent the nation over (MNRE).

2.3 Biomass Energy system

Biomass gasification is the procedure wherein strong biomass materials are changed over into a blend of ignitable gas by warming in a reactor (compartment) within the sight of restricted oxygen. This gas contains hydrogen, methane, carbon dioxide. This syn-gas is utilized as fuel for IC engines for creating power.

An entirety of around 500 biomass power and co generation tasks rating to 4760 MW cutoff have been presented in the country for supporting ability to the system. Additionally, around 30 biomass forces tasks are of 350 MW are under various periods of execution. Around 70 co generation activities are under execution with surplus limit gathering to 800 MW.

States which have taken specialist position in use of biogases cogeneration adventures are Andhra Pradesh, Tamil Nadu, Karnataka, Maharashtra and Uttar Pradesh. The fundamental States for biomass power errands are Andhra Pradesh, Chhattisgarh, Maharashtra, Madhya Pradesh, Gujarat and Tamil Nadu.

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The complete introduced limit of biomass cogeneration is 4826.23MW. About 55MW of lattice associated biomass control limit is appointed and another 90MW limit is under development. India has 5940MW biomass based power plants comprising 4946MW grid connected.

3 DG installation at different places

The Table 1 shows the information of solar plants in some districts of Karnataka, the overall generation of power by using solar in Karnataka

Table 1. Solar Power generation in Karnataka

District	Taluk	Power rating MW
Bagalkot	Jamkhandi	40
	Bilagi	20
	Guledagudd	20
Bellari	Sandur	20
	Kudligi	20
	Kurugodu	20
Belagavi	Gokak	20
	Hukeri	20
	Bailhongal	20
	Kittur	20
	Nippani	20
Bidar	Yelandur	20
	Hanur	20
Chikkamagaluru	Kadur	20
	Tarikere	
	Chikkamagaluru	
	Mudigere	
Chitradurga	Holalkere	20
	Hosdurga	20
Dakshina Kannada	Mangaluru	
	Belthangady	
Davanagere	Jagalur	20
	Davanagere (Mayakonda Const)	10
Hassan	Shiggaon	20
	Savanur	20
	Alur	
	Arkalgud	
Kodagu	Madikeri	
	Somvarpet	
Mysuru	Nanjangud	20
Tumakuru	Madhugiri	20
	Koratagere	10
Bangalore	DodBallapur	20

Source: MNRE 2017-18

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about 2010MW as per report MNRE 2016-17, installed capacity of solar is 6145.71MW as per the year 2019 (MNRE). From this details it is possible know the exact location with power rating and also gives idea about the installation of new solar plant.

The place which is empty in Table 3.1 filled with indicates there is no solar installation in this district. Hence by installing new power plant it is possible to reach the demand of electricity.

The proposed solar plants which can be added in districts are shown in Table 2.

Table 2. Proposed Solar power Installation in Karnataka

District	**Place**	**Power rating in MW**
Kolar	Yelsandra	3
Raichur	Itanal	3
Belgaum	Belakawadi	5
Mandya	Maddur	10
Bagalkot	Almatti	4
Total		25

Source: MNRE 2018

The total cost for the proposed solar power plant installation in the above mentioned places is

For 1MW=4.5Crore
For 25MW=25*4.5=112.5Crore

The total amount required for installation is about Rs 112.5crore as of 2018-19.

Table 3. Wind Power generation in Karnataka

District	**Location**	**Power rating in MW**
Bagalkot	Bommasagar Santagiri Anthargiri	30
	Hungund Tondehal	40
	Gadyal Kalabilagi	6 34
Gadag	Narigal Jampur, kuchalpur	20
	Magadi	10
	Anur,Bentur	40
Chitradurga	Ramajaghahali Muchchukunte	12.05
	Balenahalli pelurhatti	30
	Chikkobanahalli Turuvanur	100

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Udupi	Perambur	1
Dharwad	Gudisagar Naganur Boganur Kannur	14
	kolivad	135.5
	Lingadal	30
	Sanshi	90
Gulbarga	Jhalaki	
	Buzurg sirrur	10
	Hadalagi	
	Mothakapalli	30
Bijapur	Masbinal	18.4
	Ukkali	
	Hegadehal	101.2
	Basavanabagewadi	51.00
Bellary	Kudligi Hosanahalli	34
	uttange	40
	Dasarahalli	44
	Nimbalgiri	30
Koppal	chikkoppa	100
Davangeri	Machihalli	10.8
	Yalavadhalli Daginakatte	80
Tumkur	Chikkajalodu Bodesanahalli	150
Hassan	Hradhanahalli	23
Chikkamagaluru	B.B hills lingadahalli	93 10

Source: KREDEL 2017-18

The place is empty in Table 3 indicates there is no installation of wind plant.

Table 4. Proposed Wind Installation in Karnataka

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District	Places	Power rating in MW
Bagalkot	ukal	10
Gadag	Mundagiri Munchunkante	4 4
Chitradurga	Pelurhatti	4
Bellari	Hosanahalli	8
Davangere	Harappanahalli	8
Hassan	Hollenarasipura	10
Chikkamagaluru	Mulleyanagiri	5
Shimogga	Chennagiri Shikaripura	8 1
Total		62

Source: MNRE 2018

The proposed wind power plants which can be added in different districts are shown in Table 4. The wind installation capacity is very less in some places. Hence by increasing the generation capacity, the demand is reached. The wind power installation is 4779.14MW as per the year 2019(MNRE).

The total cost for the proposed wind power plant installation is

For 1MW=15.15Crore
For 62MW=62*15.15=939Crore

The total amount required for installation is about Rs 939 crore. (Cost analysis as of 2014).

Table 5. Biomass Power generation in Karnataka

District	Taluk	Power Rating in MW
Mandya	Malavalli	8.50
Hassan	Hassan	8
Davangere	Davangere	2
Raichur	Raichur	7.5
Chitradurga	Hiruyur	20
Koppal	Gangavathi	12
Bellari	Siruguppa	6
Tumakuru	Tumakuru	7.03
Raichur	Manvi	7.50
Mysuru	Metagalli	6
Haveri	Shiggao	30
Raichur	Raichur	15
Total		129.53

Source: KREDEL 2017-18

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The Table 5 shows Biomass generation in Karnataka. The biomass installation is 134.03MW as per the year 2019 (MNRE). The new biomass plants which can be added in different districts are shown in Table 6.

Table 6. Proposed Wind Installations in Karnataka

District	**Places**	**Power rating in MW**
Mandya	Krishnarajpet	4
Davangrere	Harihar	2
Koppal	Kartagi,Gangavathi	4.5
Bellary	Sirugoppa	2
Tumkuru	Gubbi	2
Raichur	Yogasahanahalli	2
Raichur	Walkamdinni	5
Mysusru	K R Nagar Hootagalli	7.5 2
Total		31

Source: MNRE 2018

The total cost for the proposed Bio-mass power plant installation is

For 1MW=5Crore
For 31MW=31*5=155Crore

The total amount required for installation is about Rs 155 crore. (Cost analysis as of 2018).Therefore by increasing the installation in each taluk power generation is increased. The total cost for the RES based DG is shown in Table 7.

Table 7. Approximate cost for the proposed RES based DG

RES	**Power in MW**	**Cost/MW in Crore**	**Total cost in Crore**
Solar	25	4.5	112.5
Wind	62	15.15	939
Bio-mass	31	5	155
Total	118		1206

In order to reach the demand of electricity the expansion planning is required. By observing the information in the tables of solar, wind and Biomass expansion is needed. To expand the system some non linear formulations are considered. Such as cost, Active power loss, voltage stability. By considering these parameters a Multi stage Distribution Expansion Planning optimization is used.

4 Conclusion

Distributed Generation has a right track in harnessing various forms of new & renewable energy sources. This paper has presented renewable energy source plants and DG units at different places. This helps to place the new RES based DG for expansion planning. As per the analysis the total cost estimated to install

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new RES based DG in Karnataka is approximately 1206Crores. By placing the new DG it is possible to meet the demand of electricity.

5 References

[1] Abdolazim Yaghoot1, Ghafur Ahmad Khanbeigi, "Generation expansion planning in IEEE power system using probabilistic production simulation",2010 IEEE International Energy Conference.

[2] Ida Fuchs, Steve Voller, "Improved Method for Integrating Renewable Energy Sources into the Power System of Northern Europe", 2011 IEEE.

[3] A. Silva et al, "Reliability worth applied to transmission expansion based on ant colony system", Electrical Power and Energy Systems, Vol. 32, pp. 1077-1084, 2010.

[4] D. Saxena et al, "Application of computational intelligence in emerging power systems", International Journal of Engineering, Science and Technology, Vol. 2, No.3, pp 1-7, 2010.

[5] Edris Pouresmaei, Majid Mehrasa , Catalão, "A Multifunction Control Strategy for the Stable Operation of DG Units in Smart Grids", IEEE transactions on smart grid, vol. 6, no. 2, march 2015.

[6] I. Waseem, M. Pipattanasomporn, and S. Rahman, "Reliability benefits of distributed generation as a backup source," in Proc. IEEE Power Energy Soc. Gen. Meeting, Calgary, AB, Canada, 2009, pp. 1–8.

[7] K. Qian, C. Zhou, Y. Yuan, X. Shi, and M. Allan, "Analysis of the environmental benefits of distributed generation," in Proc. IEEE Power Energy Soc. Gen. Meeting, Pittsburgh, PA, USA, 2008, pp. 1–5.

[8] M. Mehrasa, M. E. Adabi, E. Pouresmaeil, and J. Adabi, "Passivitybased
Control technique for integration of DG resources into the power grid," Int. J. Elect. Power Energy Syst., vol. 58, pp. 281–290, Jun. 2014.

[9] Sumanth Yamujala, Mehtab Fatima, Indrakanti Abhinay Sri Teja, Yalavarthi Lahari, "Present scenario of distributed generation in India - Technologies, cost analysis & power quality issues", 2014 Innovative Applications of Computational Intelligence on Power, Energy and Controls with their impact on Humanity (CIPECH), 2014.

[10] www.mnre.gov.in

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