



Bioenergy Potential in the Iranian Energy Market

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How do you know Iran?







Iran Climate Diversity

- Moderate temperature, high humidity and high amount of annual precipitation in north regions (the coastal plains of the Caspian Sea);
- Low temperature and severe winters in west regions;
- High temperature, low precipitation in east and central regions;
- High temperature, high humidity and very hot summer in south regions (the coastal plains of the Persian Gulf and Oman sea)



















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2- Biomass Resources Classification in Iran





Biomass Resources Major Classes

- 1. Primary Agricultural Biomass (on-farm post harvest residues)
- 2. Secondary Agricultural Biomass
- **3. Primary Forestry Residues**
- 4. Secondary Forest Biomass
- 5. Urban Waste
- 6. Manure
- 7. Energy Crops







1. Primary Agricultural Biomass

Primary residues – Wheat, barely straw, sugarcane top, maize stalks;

Horticulture: thinning/Prunning







2. Secondary Agricultural BiomassSolid:

- Rice husk and sugarcane Bagasse
- Sugar and Candy Industries' waste
- Nuts Shell
- Plant Oil industries' waste and residues
- Fruit and Vegetables Processing Industries' waste and residues
- Fodder and feed producing industries' waste and residues
- Other Industrial organic waste

•Liquid:

- Alcohol and Nectar Production Wastewater
- Slaughterhouse and Dairy Production Wastewater
- Meat Processing Wastewater
- Other Industrial Organic Wastewater







3. Primary Forest Biomass

- Logging Residues
 - Residual Foliage
 - Sawdust
- Forest Fuel
 - Wood Fuels
 - Charcoal







4. Secondary Forest Biomass

- Sawmill Residues
 - Residues from round wood processing
- Residues from Wood (panel) Material Production
 - Veneer and Plywood Production Residues
 - Fiberboard Production Residues
 - Particleboard Production Residues
 - Laminate and Parquets Production Residues
- Wastes and Residues from Final Products Production
 - Carpentries
 - Door and Window Production
 - Furniture Production waste and residuesPulp and Paper
- Pulp and Paper Industry
 - Black Liquor







WOOD CYCLE:







5. Urban Waste

- Municipal Wastewater (Sewage)
- Municipal Solid Waste (MSW)







6. Animal Manure

Poultry

- Chicken
- Turkey
- Ostrich
- Livestock
 - Cattle and Bull
 - Sheep







7. Energy Crops

- Energy Plants Cultivated on Arable Land
 - Short Rotation Forest Plantations
 - Agroforestry
- Energy Plants Cultivated on Degraded Lands
 - Jatropha
 - Switchgrass
 - Miscanthus
- Algae







3- Biomass Resources Potential



Federal Ministry for Economic Affairs and Energy		Dewable s
Rank Country	Production (1000 MT)	Source: Indexmundi
1 <u>EU-27</u>	144,880.00	
2 China	123,000.00	
3 India	94,000.00	
4 <u>United States</u>	53,431.00	
5 Russian Federation	52,000.00	
6 <u>Canada</u>	28,500.00	
7 <u>Australia</u>	25,500.00	
8 <u>Pakistan</u>	24,500.00	
9 <u>Ukraine</u>	20,000.00	
10 <u>Turkey</u>	15,000.00	
11 Kazakhstan	14,500.00	
12 Iran, Islamic Republic Of	13,000.00	
13 Argentina	12,500.00	
14 Egypt	8,950.00	
15 <u>Uzbekistan</u>	6,800.00	
16 <u>Brazil</u>	6,000.00	
17 <u>Afghanistan</u>	5,025.00	
18 Morocco	4,700.00	
19 <u>Mexico</u>	3,870.00	
20 Algeria	3,600.00	

















Forests



Total Area: 14,000,000 ha

Plantations: 20,000 ha

Forest Biomass Potential











Wastewater Energy Recovery









Agricultural+Horticultural+ Manure+Forestry Biomass









Cities with more than 250,000 population: MSW Energy Potential









4- Domestic Technological Capacity

		Domestic Capabilities				
		Low capability			High capability	
*	Federal Ministry for Economic Affairs and Energy	No Ability	Able to Operate	Able to Assemble	R&D and Pilot	Able to estar Manufacture and Install and Operate
Equipmen	ts					und oppilate
Biomass Pretreatment	Shredder					
	Sieve					
	Dryer					
Biomass Transportation	Conveyer			•	•	•
	feeder					
7 1 /	Furnace					
Combustion B	Boiler					
nstruments	Instruments					
Air Feeders	Gas Tubes					
	fan					
	Compresser					
Heat Recovery	Economisers					
Exhaust Gas Cleaning	Cyclone					
	Filter					
	Scrubber					
	Dust Chamber					
	Bag Filter					
	Electrostatic					
	Scrubber		B			
	Anaerohic		Solution	Worldwide.		





5- Bioenergy Development in Iran





Bioenergy Plants

- I Environmental activities
- II Small Pilot Plants
- III Waste Management Option



SUNA, Biomass Office, Municipalities, Wastewater Companies, Rural Electrification Centre:

- 460 kw power generation capacity installed from Biogas in Saveh a city in 200 km of Tehran- (2005).
- 2. Assessment of potential and feasibility study of urban solid wastes of 10 power plants operating on waste-based fuels (2010).
- 3. Preparation of Bioenergy atlas of Iran
- 4. Study of a 2-megawatt biogas power plant in Tehran (Taraghdari, et al., 2012)
- 5. Landfill gas extraction and power generation in Mashhad and Shiraz with 600 and 1000 KW capacity respectively (2008).
- 6. Establishment and Running of Tehran Sewage Refinery in Capacity of 4800 KW
- 7. Two 6-MW Power Plants Operating on Waste-Based Fuels in Mazandaran Province
- 8. Waste Water Treatment Center in the North of Isfahan with the Capacity of 1-MW
- 9. 3-MW Power Plant Operating on Waste-Based Fuel in Tehran

*





Installed biomass Power plants in Iran







Mashhad Landfill gas to electricity











Tehran WWTP CHP 5 MW









Biogas Power plant









Incentives:

Feed in Tariffs July 21st 2015 20 years Guarantee

Renewable Type	IR. Rials / kWh	*Euro
		Cents/kWh
Biomass Landfill gas to Electricity	2900	8.6
Biomass Anaerobic Digestion	3150	9.3
Biomass- incineration	5870	17.3
Wind over 50MW	4060	12
Wind equal to and lower than 50 MW	4970	14.7
Wind less than 1 MW (specific to consumers	5930	17.5
and limited to connection capacity):		
Solar farm over 10 MW	5600	16.5
Solar farm lower 10 MW	6750	20
Solar less than 100KW (specific to consumers	8730	28.3
and limited to connection capacity)		
Solar less than 20 KW (specific to consumers	9770	28.9
and limited to connection capacity)		
Geothermal	5770	17
Expansion Turbines	1800	5.3
Waste Heat Recovery in Industrial process	3050	9
Hydro less than 10 MW	3700	10.8
Other Renewables (not Hydro)	4873	14

*converted from IRR to Euro by EX.com on 2nd. September 2015





Biomass in the newest version of FiT

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Biomass Landfill gas to Electricity	2900	8.6
Biomass Anaerobic Digestion	3150	9.3
Biomass- incineration	5870	17.3

Official Link:

http://www.suna.org.ir/suna_content/media/image/2015/08/3622_orig.pdf







Potential Parners:

- Municipalities (unsorted waste)
- Agribusiness
- Livestock Farms
- Food and Beverage Industries
- Wastewater Treatment Plants













Alexander von Humboldt Stiftung/Foundation