



Ministry of Energy

Renewable Energy Organization of IRAN (SUNA)

Department of Biomass

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Background

Renewable Energy Organization of Iran (SUNA)

- ▶ SUNA has taken effective steps in planning, policy making, providing solutions and publicizing of information in this field such as:
- ▶ Studying of research policies for specifying the framework of country's renewable energy strategy, wind and other renewable energy resources development plan and other activities on promotion and publicizing such as participation in exhibitions, organizing of training courses, arranging for scientific visitations from renewable energy generation sites and publishing books and publications. At the same time, SUNA has played a key role and effectively cooperated with the Renewable Energy Headquarters of Vice-Presidency for Science & Technology with the aim of creating synergy among all those having a role in promotion of renewable energy in the country.
- ▶ One of the most important responsibilities of SUNA as the national focal point and coordination center of research and operation activities in the field of renewable energy, is creating the proper ground for study and execution of pilot projects and design and construction of power plants with participation of state and private sectors and outlining the proper path of access to diverse resources of renewable energies by utilization of high capacities and potentials of the country.



Background

Renewable Energy Organization of Iran (SUNA)

- ▶ Important measures have been taken for development of renewable energies in regard to deployment of sustainable development and we witnessed an important event in this field in July 2015, i.e. Ministry of Energy started purchasing the electricity generated from renewable resources at different price levels and respective power purchase contracts previously valid for 5 years are now increased to 20 years. More information is available in the “**Power Purchase Price from clean and Renewable Sources**” section of SUNA website.
- ▶ Of other measures taken in line with sustained development we can name the allocation of specific credit line for imposing a levy of 30 Rials/KWH for consumption of electricity (Article 69 of year 1392 [2013-2014] Budget Law) and the permission for concluding Buyback contracts with state owned and private sector investors using local equipment up to a ceiling of a hundred and twenty thousand billion Rials (Article 19 of Year 1392 Budget).
- ▶ It is planned for 5% of the national generation of electricity to be from renewable sources.



purchase tariff

Row	Technology type	Guaranteed electricity purchase tariff (IRRs per kWh)
1	Biomass-landfill	2900
	Biomass- The anaerobic digestion	3150
	Biomass- incineration	5870
2	Wind farm above 50 megawatt capacity	4060
	Wind farm with the capacity of 50 megawatt and less	4970
	Wind with the capacity of 1 megawatt and less (allocated to the subscribers and limited to the distribution capacity)	5930
3	Solar farm above 10 megawatt capacity	5600
	Solar farm with the capacity of 10 megawatt and less	6750
	Solar with the capacity of 100 kilowatt and less (allocated to the subscribers and limited to the distribution capacity)	8730
	Solar with the capacity of 20 kilowatt and less (allocated to the subscribers and limited to the distribution capacity)	9770
4	Geothermal (including excavation and equipment)	5770
5	Turbo expanders	1800
6	Waste Recycling in industrial processes	3050
7	Small hydropower with the capacity of 10 MW and less	3700
8	Other types of renewable and clean power plants except hydropower	4873



purchase tariff

Contract of guaranteed purchase of Renewable electricity

1 – Contract of guaranteed purchase of electricity from power plants subject to this announcement excluding those power plants subject to articles 5, 6, and 7 is held for a twenty-year period, in which the tariff value by the end of the contract is adjusted according to note 3 of article 3 of the Economy Council Act.

Note 1: Tariff value for all power plants subject to this article, except wind farms subject to article 2, will be multiplied by 0.7 from the beginning of the second 10-year period until the end of contract period after annual price adjustment.

Note 2: Tariff value for wind power plants with production factor of 40% and beyond in the first 10-year period is multiplied by 0.4 from the beginning of the second 10-year period until the end of the contract; for power plants with production factor under 20%, it is multiplied by 1, and for power plants with production factor between 20% and 40%, it is multiplied by an appropriate number.



purchase tariff

Contract of guaranteed purchase of Renewable electricity

- 2- The period of guaranteed electricity purchase from power plants subject to statements 5, 6, and 7 is specified to be 10 years with mentioned tariffs, and the tariff is adjusted until the end of contract according to note 3 of article 3 of the Economy Council Act.
- 3- For power plants connected to the distribution grid, subject to article 4 of Economy Council Act, 148 IRRs per kWh as transfer services rate is added to the abovementioned costs.
- 4- After the end of guaranteed purchase period, the investor will be allowed to sell electricity across the country according to bilateral contracts, energy exchange, electricity market, or any framework approved by the Ministry of Energy. Electricity exports of power plants subject to this act depends upon separate permits.
- 5- To support localization and indigenous construction of renewable and clean power plants, rate of purchase from units designed and built locally using technical know-how, is increased at most by 15 percent proportionately. The Renewable Energy Organization of Iran (SUNA) is bound to determine and publicize relevant weight tables depending on components and technology.



purchase tariff

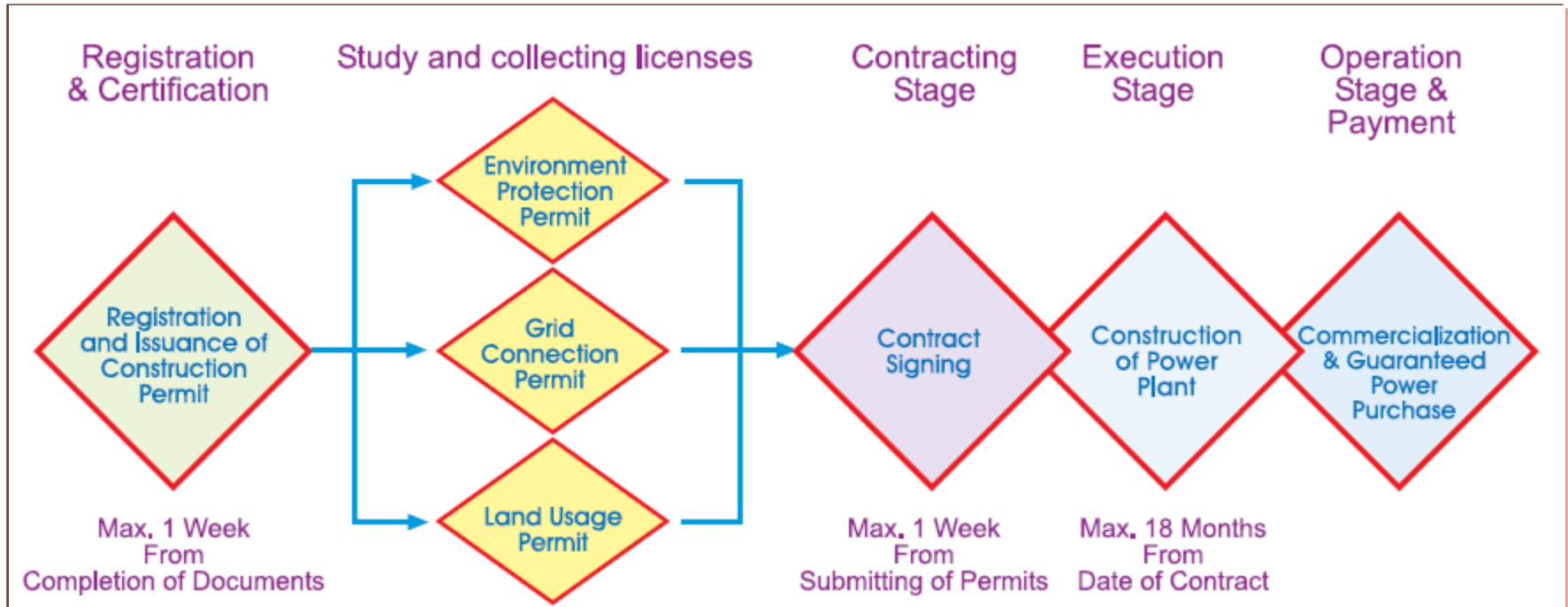
Contract of guaranteed purchase of Renewable electricity

- 6- In case investors benefit from government grants in plant construction subject to guaranteed electricity purchase contract, their tariff of guaranteed power purchase will be adjusted proportionately in order to avoid double computation.
- 7- Rates subject to this act will be applied to contracts whose power plants are commercially deployed at most within 18 months since holding the contract.
For geothermal and biomass power plants, this period is extendable up to 9 months. In case of delay in commercial deployment, the latest rate approved by Ministry of Energy as the beginning of commercial deployment of the plant will be grounded on action for remaining period of the contract.
- 8- The Ministry of Power seeks the policy of reducing guaranteed tariffs of power purchase from renewable and clean resources in proportion with increasing installed capacities in the country. The Renewable Energy Organization of Iran (SUNA) is responsible to take care of this policy in preparing tariff draft in the coming years.



purchase tariff

Contract of guaranteed purchase of Renewable electricity



Background

Department of Biomass

- ▶ In bioenergy sector activities in the field of installation plants converting waste to energy have been done and then the maps of “Biomass Energy Atlas of Iran” prepared. After preparing the atlas, 8 of incineration plants were priority for installation waste to energy plants(thermochemical) and 5 city(waste water plant) to complete engineering processes of convert sludge to energy(WWTE) and identified a number of provinces to produce of biogas from manure and animal waste.
- ▶ Government Policy is the further development of renewable energy and cleans and increases its share in the primary energy



DLR Forecast For BioEnergy in IRAN

DLR is an Institute, in a study in which the countries of South Asia, the Middle East and South-East Europe have studied the technical and economic potential source of renewable energy.

The study of the economic potential of biomass (agricultural and forest waste and municipal solid waste) in 2050 will be 3390 Mw. The economic potential of power generation from municipal solid waste in 2020, 2030, 2040 and 2050, respectively, 46/11, 53/13, 69/14 and 94/15 TWh respectively in the years will be, 1630, 1855, 2090 and 2260 MW.



Biomass sources categorizes in Iran

Sources of biomass for energy production are a wide range of materials, of which wholesale divided into six groups:

- ▶ Fuel wood, forest waste, agricultural, horticultural and food industries
- ▶ Municipal solid waste (garbage)
- ▶ Manure
- ▶ Urban waste water
- ▶ Sewage, solid waste and industrial organic waste



Agricultural waste in Iran

Now 30 percent of agricultural production in Iran more than 400 million tons of agricultural waste is lost as waste which can be converted into value-added products(as renewable electricity).

This agricultural waste, mainly in the northern regions(provinces)(Gilan, Mazandaran, Golestan) and southern (Kerman, Fars and Khuzestan) are dispersed.

Iran's major agricultural waste and agricultural residue, lignocelluloses' plants (such as rice and wheat and bagasse ,.. ..) have great potential for energy production.

For example ,In sugar production Complexes in Iran ,one million and 200 thousand tons of surplus production bagasse burns due to lack of processing industries annually.



Overall Goals of the Development of Biomass Energy in Iran

- ▶ Saving fossil fuels through replacing biomass power plants (WTE)
- ▶ Development and localization of new technologies to produce electricity from waste resources, municipal wastewater, agricultural and industrial waste, animal waste and other
- ▶ Reduce the problem of waste and the production of value-added technologies of energy production waste
- ▶ The potential for carbon trading and CDM credits by generating electricity and heat from waste technologies
- ▶ Diversify the country's energy supply portfolio and the development of renewable technologies in the bioenergy
- ▶ Localization and expansion of distributed power generation with biomass technologies



Biomass office capabilities in Iran (at SUNA)

- ▶ Research and production system technology and infrastructure development executive pilots biomass through the establishment of appropriate technology.
- ▶ studying international capacity to support the development of biomass energy extraction projects in the country, build a model and provide appropriate solutions.
- ▶ Strategic analysis, economic studies and cost estimates for the construction of biomass power generation plants.
- ▶ Technical studies, economic and environmental design and development of engineering knowledge of biogas production from biomass resources in Iran (pilots livestock, poultry, etc.).
- ▶ Technical analysis – economic, construction and development of rural energy systems from biomass resources in the country.



Activities in Biomass energy at SUNA

- ▶ FS Project: potential energy from municipal solid waste (in the cities of over 250 thousand people in the country).
- ▶ Calculate and provide of Atlas of production of energy from municipal waste in the country (project potential biomass resources survey).
- ▶ Production Biodiesel (at pilot scale).
- ▶ Equipment and development of biomass reference laboratory in Saveh site.
- ▶ Research activities aimed at developing the extraction of energy from biomass on a laboratory scale and pilot.
- ▶ Technical analysis – economic, construction and development of rural energy systems from biomass resources in the country.



Programs and subjects of BioEnergy development in Iran

- ▶ Value chain analysis, capacities and infrastructure and the potential of biomass in the country..
- ▶ Corporate at Policy making of biomass development Understanding the structure of the country and key players biomass.
- ▶ Development in the relations between the actors and institutions and other related ministry biomass energy development (such as the Ministry of Interior, Department of Environment, Ministry of Agriculture, etc.).
- ▶ Strategy and roadmap and the orientation of macro development of the biomass.



Programs and subjects of BioEnergy development in Iran

- ▶ Identify and assess the market potential of biomass in the country.
- ▶ Evaluate and localize technologies of biomass (such as biomass conversion technologies (waste),
- ▶ Trade potential of biomass in the country.
- ▶ View and development of technology in all areas of production and consumption of bioenergy and promote a sustainable future with biomass.
- ▶ Creating green jobs by encouraging bio-energy economy.



National Biomass Resource Atlas of Iran



Biomass Potential in Iran

SOURCE	POTENTIAL
Agriculture waste	6919745(TON)
Waste water sludge	194,096 kWh per day (by AD technology)
Municipal solid waste	311.28 MW
Livestock's	3142313 (TON)



Biomass energy Potentials in Iran

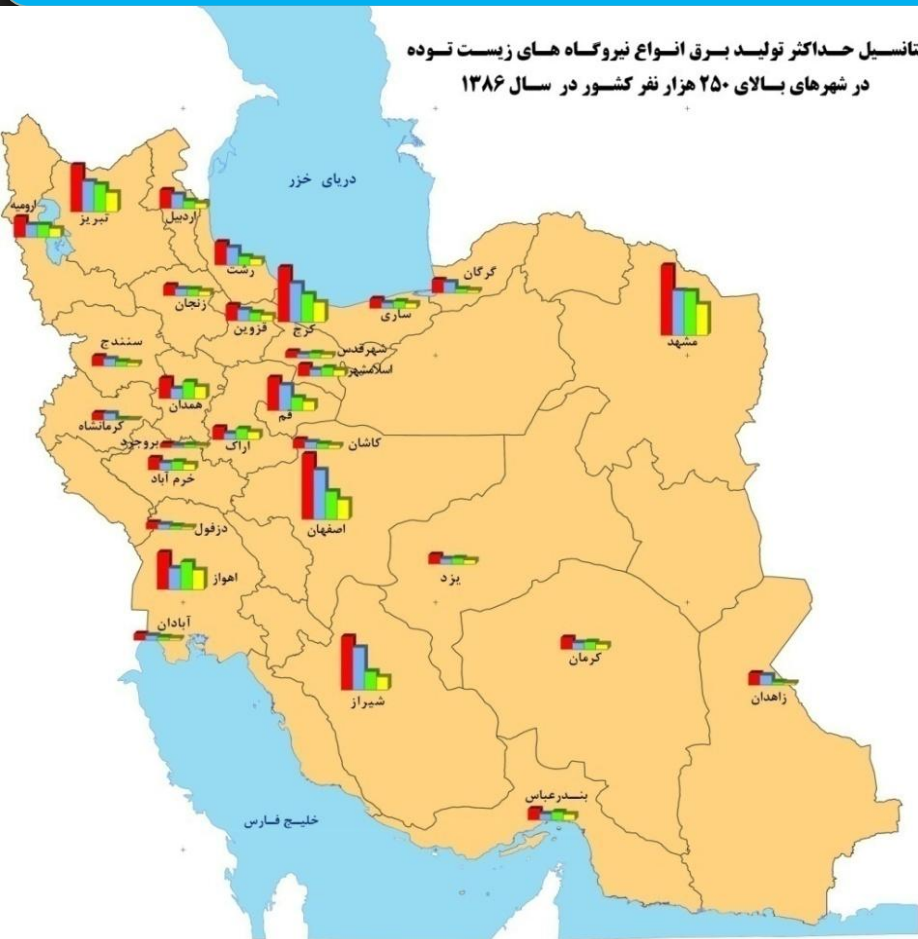
- ▶ **Waste to Energy Plants(MSW Plant)** : The estimated potential for power generation of biomass power plants, according to the latest statistics for the cities of over 250 thousand people (30 cities) amounting to **800 MWe** by technologies : **incineration-311 MW, pyrolysis-gasification- 217 MW , anaerobic digestion-159 MW and plant's landfill -112 MW** respectively
- ▶ **Potential agricultural waste**, more than **6,919,745 tones** per year in the country
- ▶ **Potential power generation from livestock** in Iran is approximately **311 MWe**.
- ▶ **Waste Water to Energy plants :1)**-The power generation potential through **anaerobic digestion**, with a total estimated production of **194,096 kilowatt-hours perday**, technical roughly equivalent to a capacity of **about 8 MWe** is expected.
- ▶ **Waste Water to Energy plants :2)**- In the case of the use of **sludge incineration technology** in WW plants have the potential to produce enough electricity for about **345,518 kWh per day**.



Municipal solid waste Potential in Iran

Energy potential based on different technologies and energy recovery from waste in 30 cities (cities over 250 thousand people)

More than 800 MWe: 311 MW of waste incineration, 217 MW pyrolysis-gasification, 159 MW anaerobic digestion and 112 MW plant's landfill separately.

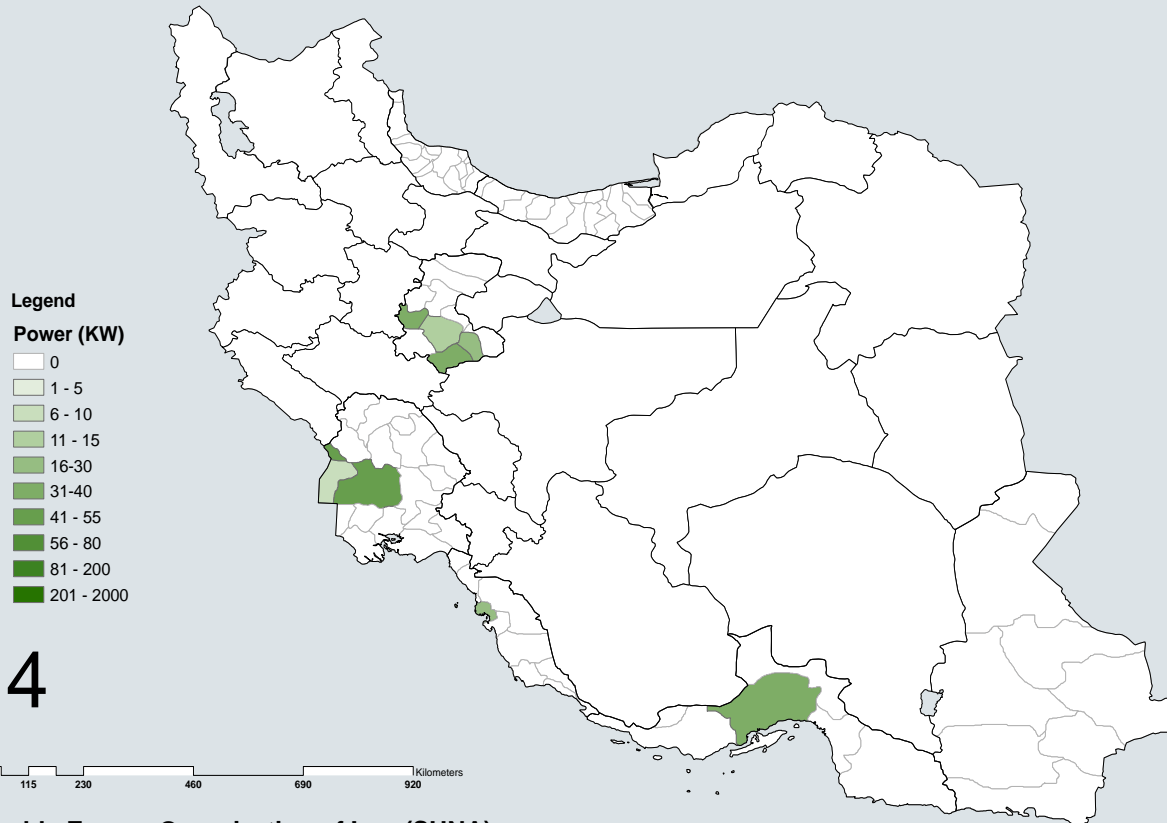


CITY	Pin(MW)	Ppg(MW)	Pad(MW)	Pslf(MW)
Abadan	2.12	1.53	1.03	0.72
Arak	3.91	1.95	3.44	3.43
Ardebil	5.95	4.48	3.42	1.71
Oroumieh	6.5	4.03	4.06	2.86
Eslamshahr	3.64	2.08	2.74	1.93
Esfahan	21.16	16.02	9.06	6.39
Ahvaz	13.00	6.9	8.99	6.34
Borujerd	1.23	0.68	0.94	0.66
Bandar abas	3.62	3.92	2.68	1.89
Tabriz	15.11	9.85	8.83	6.22
Tehran	110.8	80.27	51.64	35.96
Khoram Abad	3.89	2.31	2.73	1.93
Dezful	2.20	1.59	1.07	0.75
Rasht	7.42	5.7	2.79	1.97
Zahedan	3.81	3.15	1.00	0.71
Zanjan	3.41	3.19	2.12	1.49
Sari	3.05	1.72	2.26	1.56
Sanandaj	3.2	2.33	1.49	1.05
Shahe Ghods	2.09	1.19	1.57	1.11
Shiraz	1729	13.72	5.98	4.23
Ghazvin	5.11	3.58	2.63	1.85
Ghom	10.64	8.22	4.21	3.97
Kashan	2.92	2.05	1.52	1.07
Karaj	17.78	12.58	9.07	6.4
Kerman	3.85	2.14	2.46	0.21
Kermanshah	2.25	2.09	0.30	0.89
Gorgan	4.22	3.45	1.26	3.45
Mashhad	22.60	14.43	14.26	10.05
Hamedan	6.56	3.21	5.47	3.86
Yazd		1.66	1.9	1.34
Total	311.28	217.15	159.11	112.34

Pin : Electricity production based on incineration technology
 Ppg : Electricity production based on pyrolysis-gasification technology
 Pad : Electricity production based on anaerobic digestion technology
 Pslf : Electricity production based on sanitary engineering landfill technology

Potential Survey: Energy Atlas from Sewage Sludge

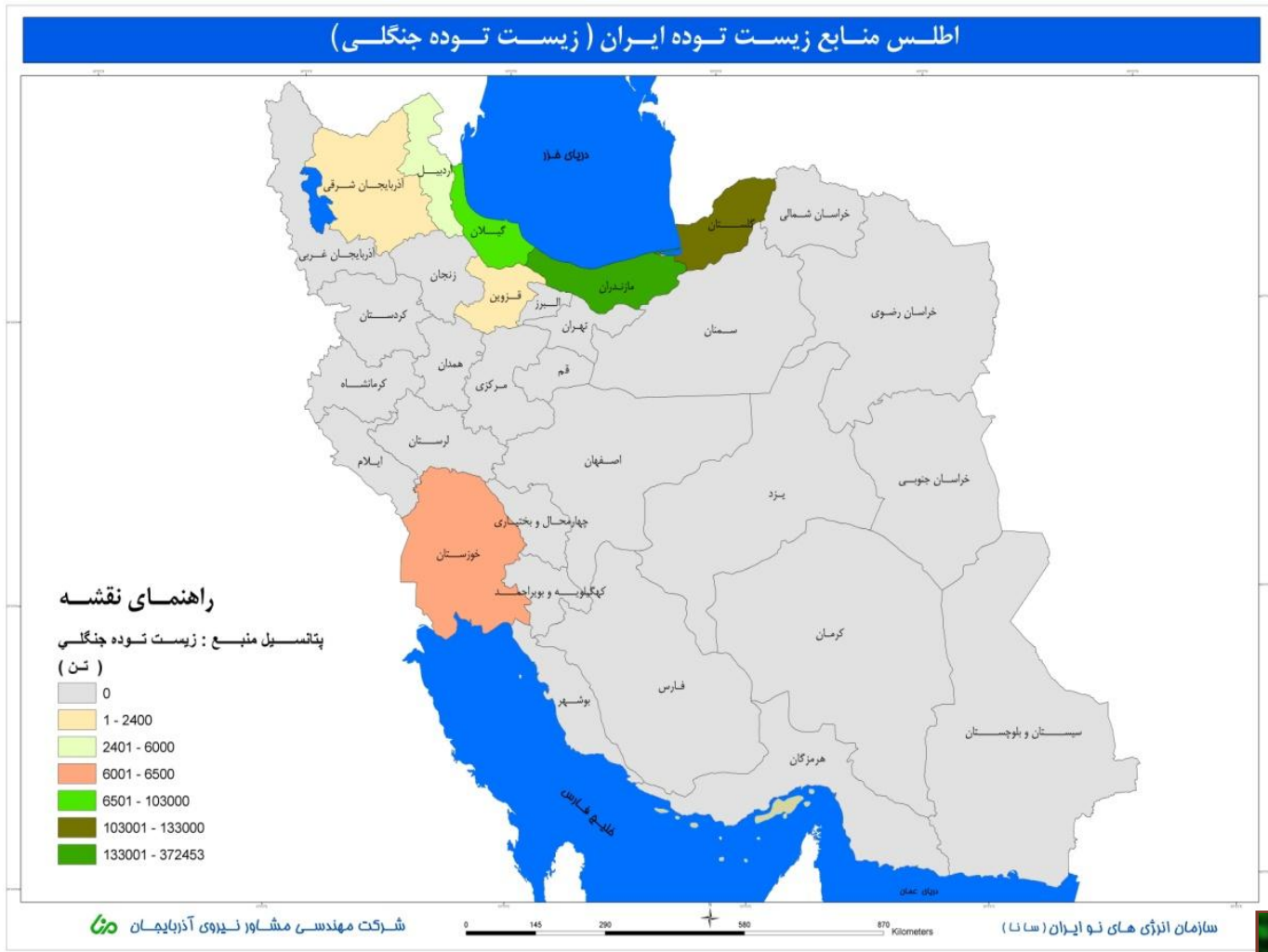
Iran Biomass Atlas (Municipal Sewage Sludge Resource)



Renewable Energy Organization of Iran (SUNA)
Azarbaijan Power Consultant Engineers (MONA)



Forest Residue Potential



Agriculture Waste Potential

اطلس منابع زیست توده ایران (زیست توده زراعی)



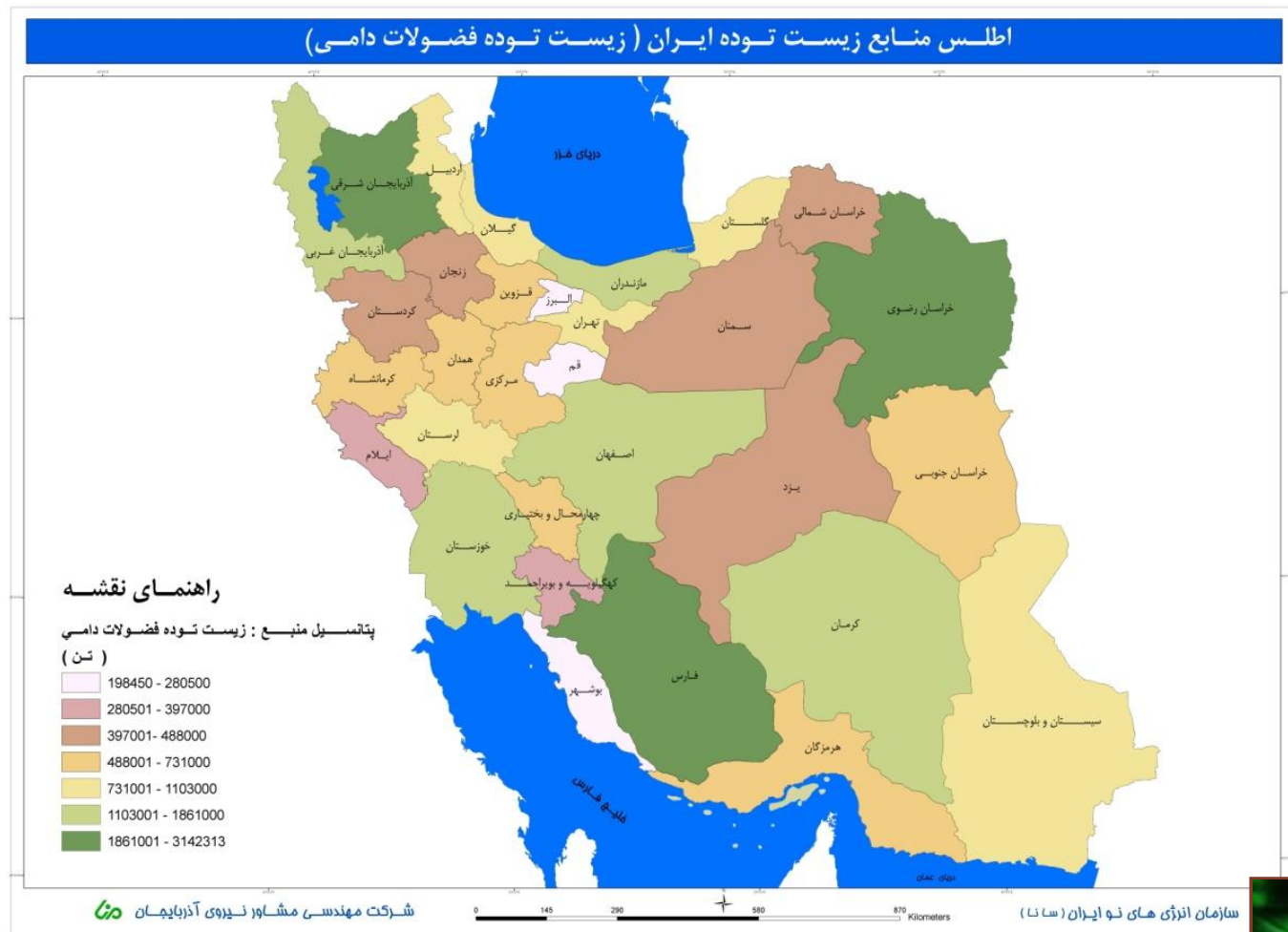
شرکت مهندسی مشاور نیروی آذربایجان

0 145 290 580 870 Kilometers

سازمان انرژی های نو ایران (سانا)



Livestock Waste Potential



BIOMASS TO ENERGY PLANTS IN IRAN



Mashhad power station with a capacity of 0.6 MW landfill



Shiraz landfill power plant with a capacity of 1060kW



Tehran wastewater plant (WWTE): 5 MW



Thank You For Your Attention

