

MARKET OPPORTUNITY

Singapore



**GREEN
ENERGY
TECHNOLOGIES**



Expected private
sector investment of
€2-2.6 billion

Contributes
€1.3 billion to
Singapore's GDP

A 'Living Lab' for
innovative solutions

OVERVIEW

- Singapore plans to spend up to €445 million on clean technology research and development to reduce energy intensity by 35% from the 2005 level by 2030.
- Singapore's green energy industry contributes €2.25 billion to the Singapore economy.
- Energy generated from solar and waste constituted 5% of the total energy generated in 2015.
- Since 2010, there has been a 19-fold increase in solar-powered energy in Singapore. In 2013, Singapore became Asia's first self-sustaining photovoltaic (PV) market - subsidies are no longer required to keep the market running.

Business Opportunities for EU Companies

1. Companies with **rich PV expertise** relating to **PV materials, cells, and modules** (high-efficiency crystalline silicon cells), **PV grid integration** (smart grid software and components), and **PV systems for the tropics** (industrial off-grid PV applications and PV hybrid systems) could find opportunities here. They could partner with Singapore companies to respond to **SolarNova**, a government-led solar lead demand programme, spearheaded by the Singapore Economic Development Board (EDB). SolarNova will support Singapore's plan to have 350 MWp of solar power in Singapore by 2020.
2. Companies with innovative **electric vehicle solutions** can tap into increasing interest generated by government initiatives to become a smart city. Both private and government have embarked on setting up some 2,000 charging points for an islandwide electric vehicle car-sharing programme and initiatives in wireless bus charging.
3. Companies developing **micro-grid solutions** can utilise various micro-grid living labs in Singapore. Pulau Semakau has the world's largest micro-grid in the tropics, integrating green energy sources including solar, wind, tidal-current, diesel, storage, and power-to-gas technologies. The lack of resident use there also allows for more risky projects to be tested.
4. Companies with **green building technologies** can tap into rising interest among real estate developers to develop eco-friendly homes and offices.
5. Companies with green energy solutions that they want to take into the Southeast Asian region can use Singapore as a springboard. Singapore has a stable economy and strong regulatory frameworks and there is high demand from neighbouring countries for green energy. More than 50 homegrown firms in green energy are actively pursuing projects overseas and partnerships with these firms are a good way to tap their regional knowledge and expertise.

Sector Characteristics

- **Strong focus on solar energy** in Singapore, given its strategic location in the tropical sun belt. Singapore enjoys an average annual solar irradiance of 1,580 kWh/m²/year.
- PV adoption continues to accelerate. The total installed capacity of PV systems is 96.8 MW in 2016, and grew at an average of **84.7% per year** from 2011 to 2016. Singapore has enough space to accommodate 6GWp of PV energy systems (17% of current energy demand).
- Singapore faces **limited green energy options**. Due to slow-flowing water and narrow tidal range, it is difficult to harness hydro-electric and tidal energy.
- There are three biomass plants in Singapore, which are located in Gardens By the Bay (0.9 MW), Sungei Kadut (1 MW) and Jurong island (35 MW). Biomass contributed to 9.3% of the total clean energy generated in 2015.
- The potential market size of **biomass energy** is estimated to be **€42 million** and will grow at a 4.5% until 2018.
- The TUMCREATE research platform in Singapore focuses on the deployment of **electric and autonomous mobility** to improve public transportation in Singapore.
- In 2014, the Building and Construction Authority of Singapore launched its third Green Building Masterplan, dedicating over **€66 million to research and adoption of green building practices**.
- The Sustainable Energy Association of Singapore (SEAS) estimates that there are about **230** renewable energy companies in Singapore. Most of them are in the PV sector.
- **Internet of Things (IoT)** is used across green energy initiatives to harness clean power along with optimisation and better utilisation of resources.



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OVERVIEW

- Singapore has built an ecosystem of research institutes and living labs to pilot various green energy solutions in Singapore.
- Singapore has been actively exploring the potential of autonomous and electric vehicles (EVs). According to Singapore's electro-mobility roadmap, EVs could make up 30% to 50% of Singapore's motor population by 2050.
- €90 million was invested in research on clean energy technologies under the banner of the Energy Innovation Programme Office (EIPO).
- Singapore ranks 2nd on green building performance among global cities. More than 25% of the city's entire built-stock were green buildings by 2014, and it aims to green 80% of its built-stock by 2030.

Key Players

Ranked by revenue retrieved from APAC region in 2015

	Company	Revenue (€)
1	Singapore Power Group Power grid and smart grid	3,232.6 Mil
2	Keppel Infrastructure Gas-to-power and waste-to-energy EPC	1,367.4 Mil
3	First Solar Photovoltaic (PV) systems manufacturing and installation	1,037.4 Mil
4	Tuas Power Biomass, waste treatment and recycling	921.9 Mil
5	Vestas Wind turbine manufacturing	590.0 Mil
6	Sembcorp Energy Waste-to-energy	135.5 Mil
7	Blue Solutions (Bolloré Group) Electric vehicles	124.2 Mil
8	ecoWise Singapore Biomass, waste treatment and recycling	42.0 Mil

Green Energy Capacity in Singapore (2016)

Solar	Biomass	Wind	Tidal Wave	Hydro
96.8 MW	36.9 MW	0 MW	0 MW	0 MW

Key Sub-sectors and Technologies

1	Supply of PV materials, cells and modules, including floating and ground mounted PV
2	Biomass from horticultural and wood waste
3	Waste-to-energy
4	Green energy R&D
5	Combined heat and power (CHP) and trigeneration
6	Electric vehicles

Solar Energy Sector Statistics (2017)

		2017	CAGR 2011-2017
Number of Installations	Residential	589	94.8%
	Non-Residential	1,309	72.8%
Installed Capacity (MW)	Residential	4.7	115.9%
	Non-Residential	95.2	102.4%