



# **THE ATOMICS INDEX**

**Crystal Equity Research, LLC**

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## THE ATOMICS

The atom is a source of tremendous energy. Energy from the sun is the result of the nuclei of atoms splitting or combining, converting matter to energy. We harness that mechanism to generate power in nuclear reactors. Photovoltaic cells make the direct conversion of light into electricity through a photoelectric effect that causes certain materials to absorb photons of light and release electrons. When these free electrons are captured, an electric current results that can be used as electricity. Most hydrogen is made from natural gas, but it's also possible to get hydrogen by snipping off electrons from plain water.

It sounds so simple. Yet companies trying to commercialize the science have plenty of challenges. We consider the economic differences of all these "atomic" power sources in The Atomix Index.

## PHOTOVOLTAIC GROUP

COMPANY	Country	PUBLIC/ PRIVATE	OPERATIONS	WEB SITE
1366 Technologies, Inc.	Private	US	Solar cell manufacturing equipment	<a href="http://www.1366tech.com/">http://www.1366tech.com/</a>
Advanced Energy Industries, Inc.	AEIS	US	Industrial power conversion devices	<a href="http://www.advancedenergy.com/">http://www.advancedenergy.com/</a>
Aleo Solar GmbH	Private	Germany	Solar power system installation	<a href="http://www.aleo-solar.com/">http://www.aleo-solar.com/</a>
Alta Devices (Hanergy)	Private	US	Thin film mobile power technology	<a href="http://www.altadevices.com/">http://www.altadevices.com/</a>
Amtech Systems, Inc.	ASYS	US	Furnace systems for PV manufacturing	<a href="http://www.amtechsystems.com/">http://www.amtechsystems.com/</a>
Ascent Solar Technologies, Inc.	ASTI	US	Flexible PV modules	<a href="http://www.ascentsolar.com/">http://www.ascentsolar.com/</a>
Beam Global	BEEM	US	Solar systems integration services	<a href="http://envisionsolar.com/">http://envisionsolar.com/</a>
Camco Clean Energy Plc	Private	UK	Renewable power producer	<a href="https://www.camco.energy/">https://www.camco.energy/</a>
Canadian Solar, Inc.	CSIQ	Canada	PV cell manufacturing	<a href="http://www.canadiansolar.com/">http://www.canadiansolar.com/</a>
Centrotherm Photovoltaics, AG	CTNK.F	Germany	Photovoltaic manufacturing	<a href="http://www.centrotherm-pv.com/home/">http://www.centrotherm-pv.com/home/</a>
China Sunergy Co., Ltd	CSUNY	China	Solar cell production	<a href="http://www.csun-solar.com/index.html">http://www.csun-solar.com/index.html</a>
Chromasun, Inc.	Private	Australia	High temperature solar panels	<a href="http://chromasun.com/">http://chromasun.com/</a>
Cypress Creek Renewables	Private	US	Solar system integration	<a href="https://ccrenew.com/">https://ccrenew.com/</a>
eIQ Energy	Private	US	Solar power solutions	<a href="http://www.eiqenergy.com/">http://www.eiqenergy.com/</a>
E-TON Solar Tech Co. Ltd.	3452.TWO	China	Solar cell, panel production	<a href="http://www.e-tonsolar.com/">http://www.e-tonsolar.com/</a>
First Solar, Inc.	FSLR	US	Solar module manufacturing	<a href="http://www.firstsolar.com/">http://www.firstsolar.com/</a>
GreatCell Solar Ltd.	DYSOY	Australia	Dye solar cell development	<a href="http://www.greatcellsolar.com/">http://www.greatcellsolar.com/</a>
Grupotec	Private	UK	Power generation, environmental solutions	<a href="http://www.grupotec.es/en/home.html">http://www.grupotec.es/en/home.html</a>
GT Advanced Technologies	Private	US	Polysilicon production technology	<a href="https://gtat.com/">https://gtat.com/</a>
Hanwha Q Cells Ltd.	HQCL	Germany	PV cells and modules manufacturing	<a href="https://www.hanwha-qcells.com/">https://www.hanwha-qcells.com/</a>
IndoSolar Ltd.	INDOSO-LAR.BO	India	Solar modules	<a href="http://www.indosolar.co.in/">http://www.indosolar.co.in/</a>
JA Solar Holdings Co., Ltd.	JASO	China	Solar cell manufacturing	<a href="http://www.jasolar.com/">http://www.jasolar.com/</a>
Jinko Solar Holding Co., Ltd.	JKS	China	Silicon wafers, solar cells, modules	<a href="http://www.jinkosolar.com/">http://www.jinkosolar.com/</a>
Juwi Holding AG	Private	Germany	Solar power generation	<a href="https://www.juwi.com/">https://www.juwi.com/</a>
Kyocera Corp.	KYO	Japan	Industrial, solar materials	<a href="http://global.kyocera.com/prdct/solar/">http://global.kyocera.com/prdct/solar/</a>
LDK Solar Co., Ltd.	LDKYQ	China	Solar module manufacturing	<a href="http://www.ldksolar.com/">http://www.ldksolar.com/</a>
Martifer Solar (Voltaia)	VLTA.PA	France	Solar power generation	<a href="http://www.martifersolar.com/">http://www.martifersolar.com/</a>
Meyer Burger Technology AG	M6YA.F	Switzerland	Solar module production	<a href="https://www.meyerburger.com/en/">https://www.meyerburger.com/en/</a>
Motech Industries	6244.TWO	Taiwan	Solar cells, modules, inverters	<a href="http://www.motechsolar.com/en/">http://www.motechsolar.com/en/</a>
NewHydrogen, Inc.	NEWH	US	Bio-based materials for solar	<a href="http://www.biosolar.com/">http://www.biosolar.com/</a>
NovAccess Global, Inc.	XSNX	US	Thin film solar development	<a href="http://www.xsunx.com/">http://www.xsunx.com/</a>
OC Oerlikon Corp. AG	OERL: SW	Switzerland	Thin film silicon solar modules	<a href="http://www.oerlikon.com/">http://www.oerlikon.com/</a>
OCI Solar Power	Private	US	Solar power generation	<a href="http://www.ocsolarpower.com/">http://www.ocsolarpower.com/</a>
Panasonic (Sanyo Solar)	PCRFY	Japan	Solar cell manufacturing	<a href="https://www.wholesalesolar.com/brands/sanyo">https://www.wholesalesolar.com/brands/sanyo</a>
Phoenix Solar AG	PS4.BE	Germany	PV system integrator	<a href="http://www.phoenixsolar-group.com/en.html">http://www.phoenixsolar-group.com/en.html</a>
PowerFilm, Inc.	Private	UK	Thin, flexible solar panels	<a href="http://www.powerfilmsolar.com/">http://www.powerfilmsolar.com/</a>
Premium Power Renewable Energy	PPRW	US	Solar power systems integration	<a href="http://www.premierpower.com/">http://www.premierpower.com/</a>
Prism Solar Technologies	Private	US	Bifacial solar modules	<a href="https://www.prismsolar.com/">https://www.prismsolar.com/</a>
PV Crystalox Solar Plc	PVCS.L	UK	Silicon ingot production	<a href="http://www.pvcystalox.com/home/">http://www.pvcystalox.com/home/</a>
RALOS New Energy GmbH	Private	Germany	Solar, LED systems integration	<a href="http://www.ralos.de/">http://www.ralos.de/</a>

Stock symbols when provided are assumed to be U.S. exchanges unless otherwise indicated.

## PHOTOVOLTAIC GROUP - continued:

COMPANY	Country	PUBLIC/ PRIVATE		OPERATIONS	WEB SITE
REC Silicon ASA	REC: OL	Norway	Solar panel supply		<a href="http://www.recgroup.com/">http://www.recgroup.com/</a>
Renesola Ltd.	SOL	China	Solar wafers and power products		<a href="http://www.renesola.com/">http://www.renesola.com/</a>
ReNu Energy	RNE.AX	Australia	Solar and biogas power		<a href="https://renuenergy.com.au/">https://renuenergy.com.au/</a>
Saferay Holding GmbH	Private	Germany	Independent solar power generation		<a href="http://www.saferay.com/">http://www.saferay.com/</a>
Siva Power, Inc.	Private	US	Photovoltaic power modules		<a href="https://www.sivapower.com/">https://www.sivapower.com/</a>
Solairedirect SA (Engie)	Private	France	Solar park development		<a href="https://www.engie.com/">https://www.engie.com/</a>
Solar Alliance Energy, Inc.	SOLR.V	Canada	Solar power generation		<a href="http://www.solaralliance.com/">http://www.solaralliance.com/</a>
Solar Fabrik, AG	SFX.FRA	Germany	Solar module manufacturing		<a href="http://www.solar-fabrik.de/">http://www.solar-fabrik.de/</a>
Solar World AG	SRWRF	Germany	Solar power kits, intergration		<a href="http://www.solarworld.de/">http://www.solarworld.de/</a>
Solaria Energia, SA	AOR: MU	Spain	Solar systems integration		<a href="http://www.solariaenergia.com/">http://www.solariaenergia.com/</a>
SolarWindow Technologies	WNDW	US	Solar power generation		<a href="http://www.newenergytechnologiesinc.com/">http://www.newenergytechnologiesinc.com/</a>
Solon Energy GmbH	SOO1: GR	Germany	Solar module manufacturing		<a href="http://www.solon.com/cw/en/">http://www.solon.com/cw/en/</a>
Solray Energy	Private	Canada	Solar power generation		<a href="http://solray.ca/">http://solray.ca/</a>
STEAG Solar Energy Solutions	Private	Austria	Solar power generation		<a href="http://energy.gildemeister.com/en">http://energy.gildemeister.com/en</a>
STR Holdings, Inc.	STRI	US	Solar module encapsulant		<a href="http://www.strsolar.com/">http://www.strsolar.com/</a>
Suniva, Inc.	Private	US	Solar cell manufacturing		<a href="http://www.suniva.com/">http://www.suniva.com/</a>
Sunpower Corp.	SPWR	US	Solar electric power technologies		<a href="http://www.sunpowercorp.com/">http://www.sunpowercorp.com/</a>
SunTech Power Holdings	Private	China	PV manufacturing, engineering services		<a href="http://www.suntech-power.com/">http://www.suntech-power.com/</a>
Surana Ventures Ltd.	SURA- NASOL.BO	India	Solar modules		<a href="http://www.suranaventures.com/">http://www.suranaventures.com/</a>
Transphorm, Inc.	Private	US	Advanced semiconductors		<a href="http://www.transphormusa.com/">http://www.transphormusa.com/</a>
Trina Solar Ltd.	Private	China	Intergrated solar power prdocuts manufac- turer		<a href="http://www.trinasolar.com/">http://www.trinasolar.com/</a>
Trony Solar Holdings	Private	China	Solar cell, module manufacturing		<a href="http://www.trony.com/html/">http://www.trony.com/html/</a>
Veeco Instruments	VECO	US	Solar, LED lighting technologies		<a href="http://www.veeco.com/">http://www.veeco.com/</a>
Wacker Chemie AG	WCH.DE	Germany	Solar cell materials supply		<a href="http://www.wacker.com/">http://www.wacker.com/</a>
Websol Energy Systems Ltd.	WEBEL- SOLAR.BO	Germany	Photovoltaic monocrystallines		<a href="http://www.webelsolar.com/">http://www.webelsolar.com/</a>
Widetronix, Inc.	Private	US	Ultra low power sensor platforms		<a href="http://www.widetronix.com/">http://www.widetronix.com/</a>
Yingli Green Energy Holding Co.	YGEHY	China	Solar cell manufacturing		<a href="http://www.yinglisolar.com/">http://www.yinglisolar.com/</a>

Stock symbols when provided are assumed to be U.S. exchanges unless otherwise indicated.

## NUCLEAR GROUP

COMPANY	Country	PUBLIC/ PRIVATE	OPERATIONS	WEB SITE
Centrus, Inc.	LEU	US	Low enriched uranium supplier	<a href="https://www.centrusenergy.com/">https://www.centrusenergy.com/</a>
DTE Energy Corp.	DTE	US	Electric utility, NuStart member	<a href="http://www.dteenergy.com/">http://www.dteenergy.com/</a>
Duke Energy Corp.	DUK	US	Electric utility, NuStart member	<a href="http://www.duke-energy.com/">http://www.duke-energy.com/</a>
Entergy Corp.	ETR	US	Electric utility, NuStart member	<a href="http://www.entergy.com/">http://www.entergy.com/</a>
Exelon Corp.	EXC	US	Electric utility, NuStart member	<a href="http://www.exeloncorp.com/">http://www.exeloncorp.com/</a>
Flibe Energy, LLC	Private	US	Nuclear reactor design, production	<a href="http://flibe-energy.com/">http://flibe-energy.com/</a>
General Atomics	Private	US	Nuclear fusion development	<a href="http://www.ga.com/index.php">http://www.ga.com/index.php</a>
Lightbridge Corp.	LTBR	US	Nuclear energy consulting services, thorium	<a href="http://www.ltbridge.com/">http://www.ltbridge.com/</a>
NAC Worldwide Consulting	Private	US	Nuclear fuel cycle consulting	<a href="http://www.nacworldwide.com/">http://www.nacworldwide.com/</a>
NextEra Energy, Inc.	NEE	US	Electric utility, NuStart member	<a href="http://www.nexteraenergy.com/">http://www.nexteraenergy.com/</a>
Nuclear Energy Consultants	Private	US	Nuclear power plant design	<a href="http://www.necenergy.com/">http://www.necenergy.com/</a>
NuScale Power, Inc.	Private	US	Nuclear power plant design	<a href="http://www.nuscalepower.com/">http://www.nuscalepower.com/</a>
Orano Group, SA	Private	France	Nuclear power plant design	<a href="https://www.orano.group/">https://www.orano.group/</a>
Southern Company	SO	US	Electric utility, NuStart member	<a href="http://www.southerncompany.com/">http://www.southerncompany.com/</a>
Westinghouse Electric Co.	Private	US	Nuclear power plant design	<a href="http://www.westinghouse.com/">http://www.westinghouse.com/</a>

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## HYDROGEN GROUP

COMPANY	Country	PUBLIC/ PRIVATE	OPERATIONS	WEB SITE
DoppStein Enterprises, Inc.	Private	US	Water electrolysis technology	<a href="http://www.doppstein.com/">http://www.doppstein.com/</a>
Hydrogenious Technologies	Private	Germany	Liquid hydrogen development	<a href="http://www.hydrogenious.net/en/">http://www.hydrogenious.net/en/</a>
HydroGreen Energy, Inc.	Private	US	Hydro power turbines, electrolysis	<a href="http://www.hgenergy.com/">http://www.hgenergy.com/</a>
HydroPhi Technologies Group	HPTG	US	Hydrogen development	<a href="http://www.hydrophi.com/">http://www.hydrophi.com/</a>

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