

India

**Neutral** (no change)**Highlighted Companies****Adani Ports & Special Economic Zone****HOLD, TP Rs868, Rs790 close**

A subsidiary of the company operates one of the largest and longest running CBG plants in India.

**Thermax****ADD, TP Rs2880, Rs2927 close**

Thermax's subsidiary has entered the biogas segment very seriously.

**Summary Valuation Metrics**

P/E (x)	Mar22-A	Mar23-A	Mar24-F
Adani Ports & Special Economic Zone	34.62	31.78	19.36
Thermax	105.61	73.15	52.68
P/BV (x)	Mar22-A	Mar23-A	Mar24-F
Adani Ports & Special Economic Zone	4.36	3.74	3.15
Thermax	9.44	8.52	7.56
Dividend Yield	Mar22-A	Mar23-A	Mar24-F
Adani Ports & Special Economic Zone	0.77%	0.77%	0.11%
Thermax	0.24%	0.31%	0.33%

# Renewable Energy

## Renewable Energy India Expo - Highlights

- We focused on the bioenergy and solar energy segments at the Renewable Energy India Expo 2023 that was held recently.
- Large companies like Reliance Industries, Adani Ports and Thermax have started foraying into the biogas space.
- While solar cells haven't got more advanced, their packaging into panels has raised power output considerably.

### Renewable Energy India Expo 2023

The expo was held in Greater Noida from 4-6 Oct 2023, which also included a one-day day conference on biogas.

### Key segments in focus

Solar energy, battery chemicals and compressed biogas (CBG) were the key segments that were in the limelight.

### Large companies foray into biogas space

Reliance Industries or RIL, Adani Ports & SEZ and Thermax have entered the biogas space and intend to optimize their technologies.

### Solar panel packaging becomes more advanced

Bifacial and half-cut solar panels use the same solar cells that are used in conventional panels, but they can generate more electricity and that too, more consistently than their conventional counterparts.

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## Renewable Energy India Expo - Highlights

### Biogas

#### Biogas production >

We focused on the biogas segment at this expo. Most of the discussions in the biogas space centred around compressed biogas (CBG) production and commerce.

Key pioneering companies that operate CBG plants include:

- **Thermax Bioenergy:** The company operates two 10TPD CBG plants in Uttar Pradesh (located at Lakhimpur and Balarampur). They are focused on refining their CBG technology.
- **AdaniOil Tanking:** The company is among the early adopters of CBG technology. It has set up a CBG plant at Namakkal in Tamil Nadu in 2019. This plant alone has accounted for 15% of India's CBG production since 2019.
- **Reliance Bioenergy:** The company has set up a CBG plant in Uttar Pradesh.

#### Biogas trading, green accounting >

Indian Gas Exchange, a subsidiary of IEX, also took part in the conference. The company stated that it is working on the following:

- Like Renewable Energy Certificates or RECs for electricity, the company is working on creating a CBG certificate.
- IGX is also considering creating a platform for the trading of biomass – the feedstock for CBG plant.

### Solar

#### Solar rooftop >

Visaka Industries has created a solar roof, very much like the Tesla roof, which can be put on top of the existing floors. This allows for an extra usable floor and power generation as well.

#### Bifacial solar panels >

Bifacial solar panels differ from conventional ones by being able to accept sunlight on both sides of the panel. They lack a back-sheet and have a greater amount of solar glass. These panels can be placed closer to each other and thus, take up 15% less land area for similar power output.

#### Half-cut solar panels >

Conventional panels significantly reduce the energy output when exposed to a partial shadow. The benefit of half-cut solar panels is that the partial shadow will penalize only half of the panel. The rest of the panel continues to generate electricity.

### Battery technology

#### Battery manufacturers >

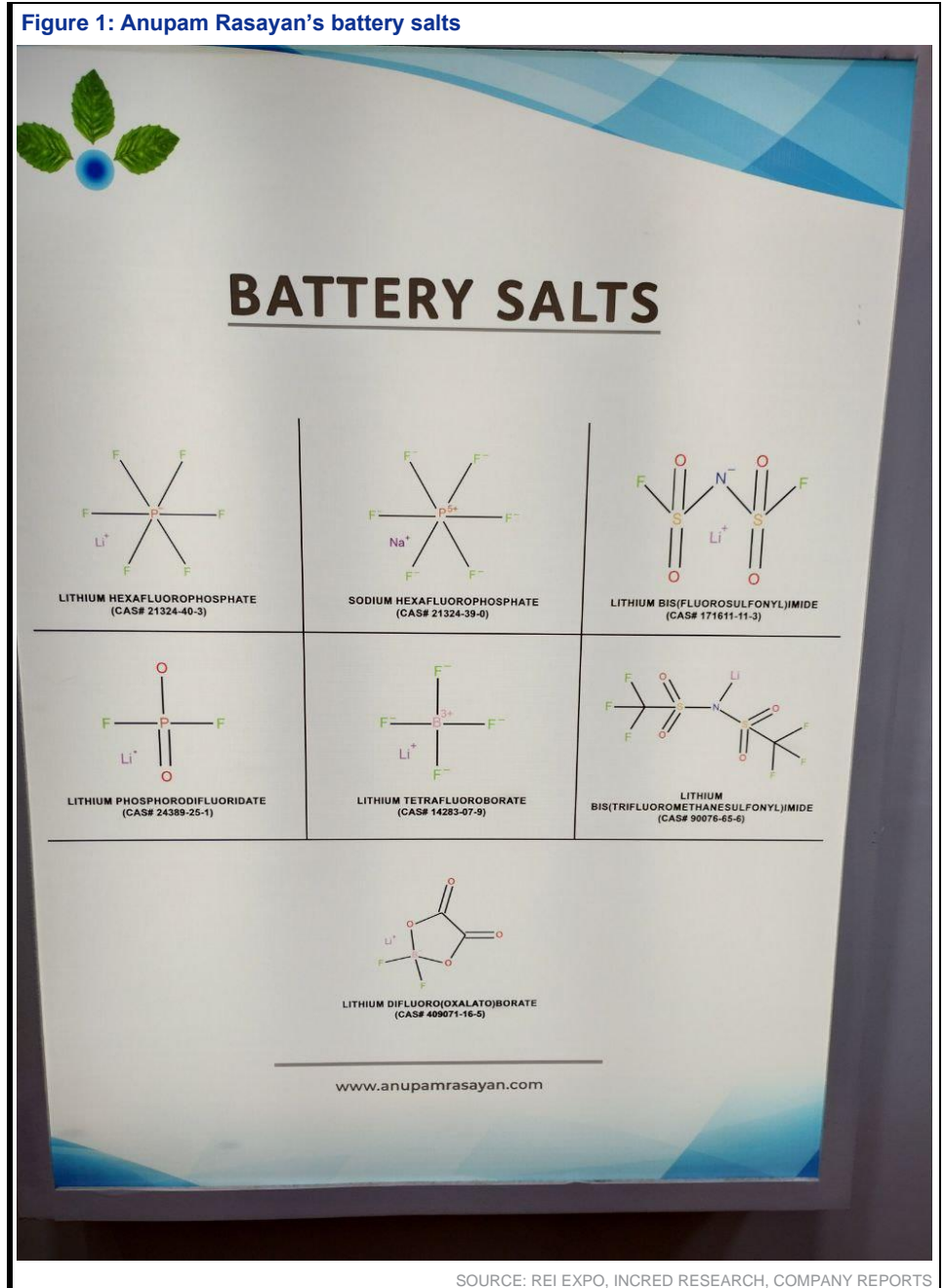
We interacted with innovative battery manufacturers like Godi Energy. This company has developed its own lithium-ion battery chemistry and is also looking at creating its own sodium-ion batteries. The company's sodium-ion batteries are expected to be 30-40% cheaper than lithium-ion batteries at scale production.

#### Battery chemicals >

Anupam Rasayan is focusing on fluoride additives to battery electrolytes. The specific molecules that the company is working on/have developed include:

- Fluoro ethylene carbonate: Can be used as a fire retardant, thereby improving battery safety.
  - LiFSI: It is said to increase battery life and efficiency.
  - LiTriFSI: A promising electrolyte.
  - NaPF6: It is the sodium counterpart of LiPF6.
  - LiDFOB: It is a promising salt for making high-energy lithium-ion batteries.
- Anupam Rasayan currently supplies these molecules to the EU, US and Japan. The company is in the process of supplying them to South Korea as well.

Figure 1: Anupam Rasayan's battery salts



GFL is also working on several battery chemicals:

- LiPF6
- NaPF6
- LFP
- PVDF: Functions as a binder for the battery.

## **Investment Ideas**

The investment ideas include:

- Thermax: Parent company of Thermax Bioenergy.
- Adani Ports & SEZ: Parent company of Adani Oil.
- Reliance Industries: Parent company of Reliance Bioenergy.
- IEX: Parent company of IGX.
- Borosil Renewables: Largest domestic manufacturer of solar glass.

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