iDERMS VPP

Renewable Power Forecasts / VPP Software

Encored Technologies, Inc.

ENCORED

iDERMS VPP

Services

Since 2020, we have been empowering our customers to full and reliable automation of their continuous energy trading activities, both technically and economically.

Our high-performance solutions for automated energy forecasting and trading are always one step ahead of the market. It is the only way we can adapt trading and portfolio optimization strategies and our innovative SaaS and on-premises software to individual customer requirements and market situation.

Services we offer

01 | Renewable Power Forecasts

02 | Trading Platform Backed by Ensemble Forecasting

03 | Renewables Nowcasting

Encored Technologies, Inc.

1. Renewable Power Forecasts

We deliver precise and comprehensive fundamental power forecasts for those engaged in the energy markets. Whether your focus is intraday, day-ahead, or longer-term, our diverse product suite, supported by our robust models, is tailored to meet your specific needs.

Higher Accuracy

Faster Implementation

Minimum Data Requirements

Extreme Reliability

Customized Forecasts

Site-specific Forecasts

Faster Implementation with minimum data requirements

What we need for input data

- Power plant coordinates (Location, address info.)
- Facility capacity by power plant
- At least hourly metered (actual) data for solar PV, ESS
- Not by each turbine, total sum of power plants
- Data period: at least 6 months to 3 years
- Instantaneous value/ accumulated value by time

Meteorological data we use

- GFS
- ECMWF

How we send and receive the data

- Web Portal (iDERMS VPP)
- API
- FTP/SFTP

What data we provide

- Solar PV, Wind power
- Day-ahead, *Intraday
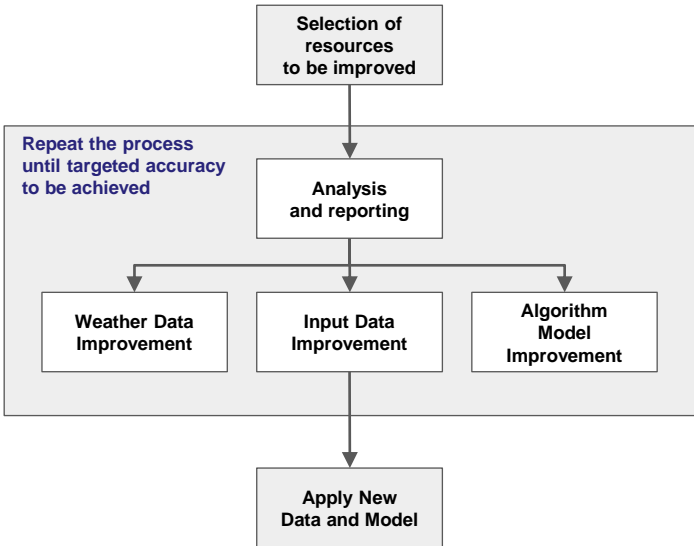- Hourly, 15min

20 business days

* Intra-day forecast is provided by 6-hour updates

1. Renewable Power Forecasts

How we improve the result

• The process we have for improving the forecasting error

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Selection of
resources
to be improved
        ↓
┌─────────────────────────────────────────────────┐
│ Repeat the process          Analysis             │
│ until targeted accuracy     and reporting        │
│ to be achieved                                   │
│                                                  │
│   Weather Data    Input Data    Algorithm        │
│   Improvement     Improvement   Model            │
│                                 Improvement      │
│                                                  │
│                 Apply New                        │
│                 Data and Model                   │
└─────────────────────────────────────────────────┘
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Category	Examples
Weather Data Improvement	• Apply the latest forecasted data at bidding time
	• Apply the forecasted data from more than a single source
	• Use NWP based regional data
Input Data Improvement	• Exclude the invalid data from the learning data set; inverter failure, on-site inspection, natural disaster, etc.
	• Exclude the snow affected data from the learning data set
Algorithm Model Improvement	• Apply the Ensemble model
	• Apply new models: Transformer, Temporal Convolutional Network, etc.
	• Apply 'Over sampling' methodology
	• Update the ESS parameter learning model

Weather Forecasts

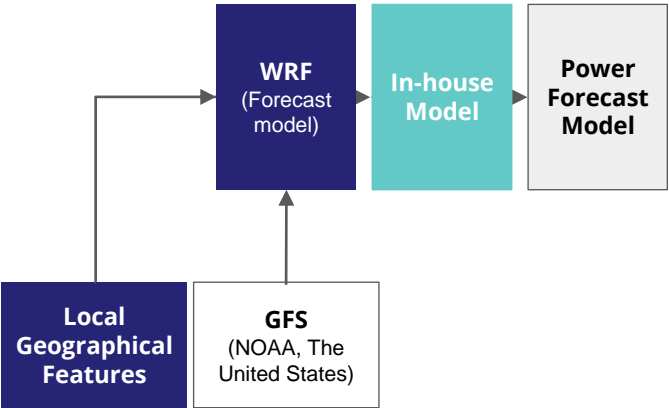• In-house weather forecasting system for the specific targeted area

Background

• Necessity of generating a numerical weather forecast specialized in forecasting renewable energy; create meteorological factors used to power forecasts such as insolation, cloud cover, and wind speed, etc.; create the closest on time weather forecasts required by the market system

Objective

• Apply the in-house weather forecasting model to the renewable energy power forecasts (1~2% improvements on accuracy)
• Development of WRF based weather forecasting system on AWS cloud
• Connect and store the external meteorological data sources for input and reference data

Features

• Simulate the WRF model on AWS cloud
• Evaluate the performance with GFS and ECMWF (HRES or HRES-WAM) and select the most suitable one for the input data
• Site/Group specific application

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                    WRF         In-house    Power
                    (Forecast   Model       Forecast
                    model)                  Model

Local
Geographical        GFS
Features            (NOAA, The
                    United States)
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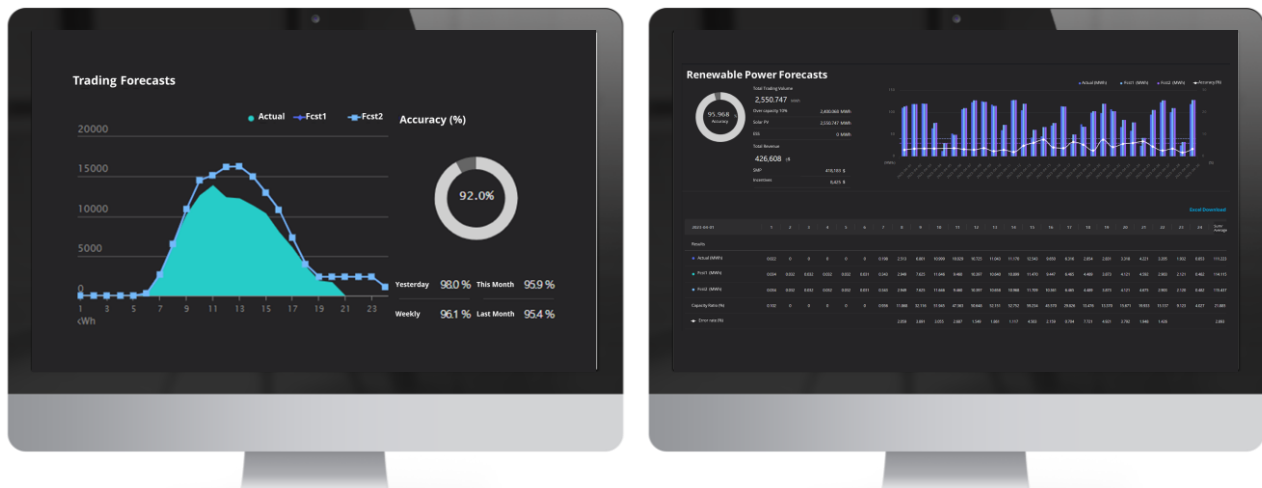
WEB Portal and API service

- Real-time power plant (single/group/total) monitoring Web
- Various data analytics and automatic reporting tools

Get access to market data, climate data and historical data.
All data, including both forecasts and historical series, is readily accessible either through our user-friendly portal or via the Encored API.

ESS Optimization

- Load - Solar PV - ESS combined optimization algorithm, maximizing profit and life of battery
- Machine learning-based algorithm that derives schedule 24 hours a day before the day starts which minimizes the operation cost of individual site or ESS equipment, away from the repetitive control according to the existing simple time unit scheduling

Problem formulation

- Goal is to minimize the value function that is the sum of
  - sum of battery wear cost
  - sum of electricity price
  - with a peak demand constraints

Solution

- ✓ Calculation of value function via state transition
- ✓ By using the Bellman's equation (backward induction)
- ✓ Improving a penalty term to control the peak

8-10% MORE PROFIT on average than using existing PMS

Process
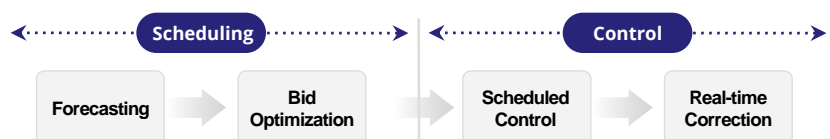
Stage	Objective
Forecasting	• Day-ahead forecasting of solar and wind power
Bid Optimization	• Find the optimal bid amount considering and forecasted power and ESS operation
Scheduled Control	• Day-ahead hourly scheduling of ESS/PCS operation and real-time control
Real-time Correction	• Adjustment the ESS charging/discharging amount by referring diff. between forecasted and actual

ESS Optimization

Solving problem with linear programming considering market price by time zone

Automatically change charging schedule to discharge at times with higher market price

Change discharge schedule to higher price time
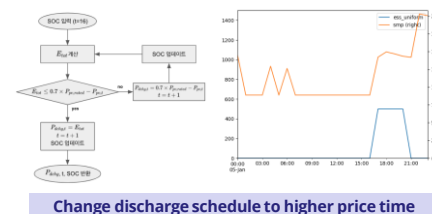
2. Trading Platform Backed by Ensemble Forecasting

Ensemble Forecasts

- By introducing perturbations into initial data or changing physical models into forecasting models, we provide a set of diverse and possible weather and renewable forecasts to support traders to make the better decision.

Ensembles

credits : UK Met Office
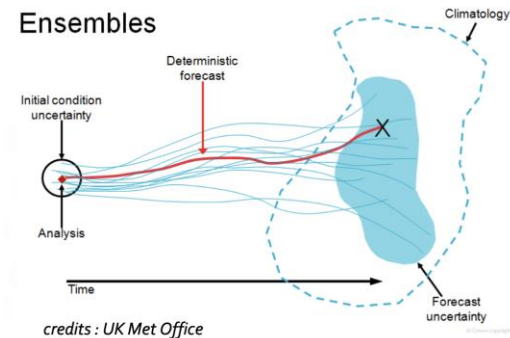
A set of Diverse/Possible Forecasts

- Better Uncertainty Quantification
- Risk Management
- Optimized Decision Making
- Machine Learning Integration

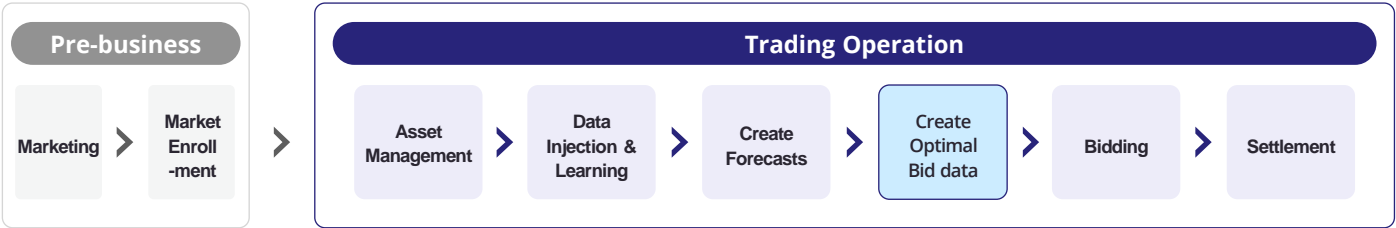**Decision Making**

Traders

Auto-bid Solution
(Market in Korea)

- High-performance, robust and powerful trading execution platform
- Covers end-to-end trading process

As the leading software provider, we've developed an automated trading solution for the market, delivering it as a SaaS solution on a web platform, hosted in the public cloud.

Encored is your trusted partner for automated bidding in the renewable energy markets in Korea. Our solution encompasses the day-ahead market and balancing market, featuring an auto-generation of bid data that maximizes its revenue and a direct interface with the market operator for seamless bid submissions and result processing.

As a SaaS offering, our service integrates essential elements such as functional and technical development, maintenance, and operation. All future updates and enhancements are included as part of our service commitment, ensuring you're up-to-date with API developments, new regulations, and algorithmic improvements to strategize effectively.

Pre-business		Trading Operation					
Marketing	Market Enroll-ment	Asset Management	Data Injection & Learning	Create Forecasts	Create Optimal Bid data	Bidding	Settlement

End to End Trading Process
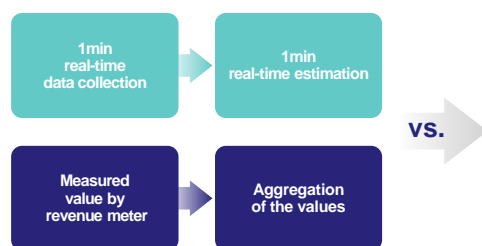
3. Renewables Nowcasting

Estimation of Real-time Generation

- Leverages sparse sampling techniques for precise, real-time energy output predictions
- Employs advanced AI models and real-time data processing technologies for highly accurate energy generation estimates
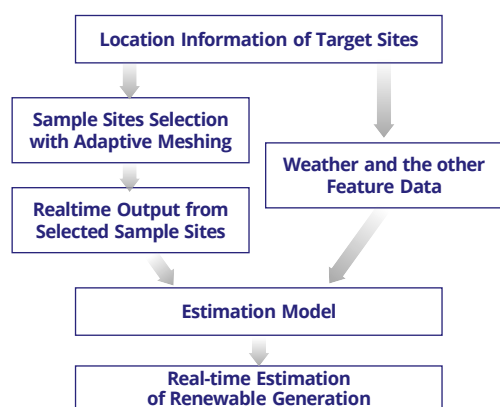
Comparison of nowcasting and measurement aggregation

* Meter readings typically have a delay of over an hour, making real-time assessment challenging with traditional methods.

* In contrast, we use one-minute samples to provide real-time estimates of the total energy output, significantly reducing this latency and enhancing responsiveness.

1min real-time data collection → 1min real-time estimation
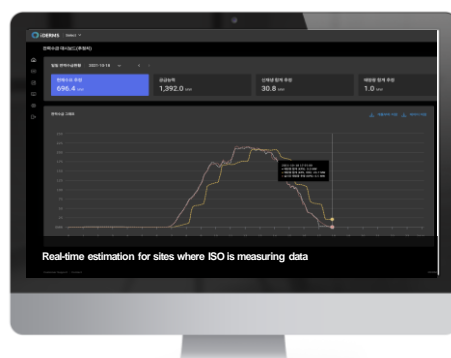
Measured value by revenue meter → Aggregation of the values

vs.

1min real-time estimation

Measured value

Renewables Nowcasting Framework

Location Information of Target Sites

Sample Sites Selection with Adaptive Meshing

Weather and the other Feature Data

Realtime Output from Selected Sample Sites

Estimation Model

Real-time Estimation of Renewable Generation

Result

Month	NMAE10 (%)	
	Individual power plant average	Average of all collective resources
Jan.	3.8089	1.1124
Apr.	3.1537	0.6755
Jul.	4.0353	0.9911
Oct.	4.5939	1.0125

Implementation in Jeju Island

Implementation Details

- Real-time metering modems are installed for 99 sites of total 700 sites
- Power generation, voltage, current, etc.
- 5min, 15min, 1hour, 1day unit generation data statistics and analysis

Real-time estimation for sites where ISO is measuring data

Real-time estimation for sites where ISO is not measuring data

- White-line shows ground-truth value
- Red-line shows the estimated value that is created by Encored algorithm
- The value is created every minute and it's error is around 1%

- White-line shows ground-truth that ISO measures
- Purple-line shows real-time estimation for PPA plants
- Blue-line shows real-time estimation for BTM plants
- Red-line shows real-time estimation for all plants installed in Jeju

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iDERMS VPP

Instant setup

Individually customize the algorithms and start forecasting immediately

Quality

high-performing, robust, and powerful algorithms, promising superior results

Reliable

Experience the utmost reliability in automating your forecasting workflow