# Wind Energy Status Information based on Open Data – Project Documentation

## Wind Energy Information Platform

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## 1. Introduction into Project Context

The "Power of Renewable Energy" is an informational platform focused on raising awareness about wind energy in Europe. The goal of this project is to educate users, provide structured data on wind power usage, and highlight investment opportunities in renewable energy. It serves as a web-based knowledge hub with four main sections: Home , Statistics , Wind Farms , and Investment .

### Project Objectives

- Create an educational resource about wind energy in Europe
- Visualize statistical data using charts and maps
- Provide detailed information about European wind farms
- Introduce real-world investment opportunities in green energy
- Build a responsive, user-friendly interface
- Implement interactive elements like EmailJS subscription and Leaflet.js maps
- Convert the website into a mobile app for broader accessibility

### Application Scenarios

The platform supports multiple use cases:

- Educational Resource : Users can learn about wind energy fundamentals
- Data Visualization : Interactive statistics and maps help understand regional differences
- Wind Farm Exploration : Detailed information about major European installations
- Investment Guidance : Showcases companies and opportunities in the renewable sector
- Mobile Accessibility : Available as both a web and Android application

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## 2. Overview over the Different Parts

### System Architecture

The system follows a client-side architecture with minimal backend requirements. It uses static hosting and integrates third-party services for interactivity.

**Components Breakdown:**

Frontend Technologies

- HTML5/CSS3/JavaScript
- CodePen (for initial prototyping)
- Visual Studio Code (final integration)
- Netlify (hosting)

Interactive Libraries

- Leaflet.js – for map visualizations
- EmailJS – for email subscription functionality
- Chart.js – for statistical representation

Mobile Conversion Tools

- Median – converts websites into APK files
- BlueStacks – Android emulator for testing

Hosting & Deployment

- Netlify – for live deployment of the web version

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## 3. Deep Dive into Different Parts

### 3.1 Website Structure and Pages

The website consists of four main pages , each accessible via a navigation bar.

**Page 1: Home**

- Title: “Power of Renewable Energy”
- Brief introduction to wind energy
- List of top six wind energy-producing countries in Europe
- Footer with company name and email subscription form (EmailJS integrated)

**Page 2: Statistics**

- Overview of wind energy growth (2020–2025)
- Map showing wind zones across Europe (Leaflet.js)
- Wind speeds and energy potential per zone:
    - Baltic Zone;
    - North Sea Zone;
    - Atlantic Zone;
    - Mediterranean Zone;

**Page 3: Wind Farms**

- Charts showing turbine growth by region (2015–2023)
- Interactive map of largest wind farms in Europe (Leaflet.js)
- Clickable list of wind farms that zooms into their location
- Data includes number of turbines, country, and annual output

**Page 4: Investment**

- Explanation of benefits of investing in wind energy
- Showcase of three German-based companies:
    - Nordex Group (€9M capital, 5–7% return)
    - Siemens Energy (€2M capital, 8–9% return)
    - Energy AG (€10M capital, 5–10% return)
- Subscription form at the bottom (EmailJS)
- Social media icons linking to placeholder profiles

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### 3.2 Frontend Development Process

#### Initial Prototyping

- Each page was built individually using CodePen
- Real-time editing allowed rapid design iteration
- Pages were exported as ZIP archives

#### Final Integration

- All pages were imported into Visual Studio Code
- Navigation menu was created to link all sections
- Consistent layout and footer across all pages
- Final build exported as a single ZIP file

#### Hosting

- Website deployed via Netlify
- Public URL provided for online access

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### 3.3 Mobile App Conversion

#### App Creation

- Used Median to convert the website into an Android APK file
- Integrated all assets including HTML, CSS, JS, and images

#### Testing

- Installed BlueStacks on PC to emulate Android environment
- Tested full functionality within the emulator
- Verified responsiveness and interaction flow

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## 4. Web Platform Implementation

### 4.1 Frontend Architecture

The website is a static single-page application (SPA) with internal navigation between different HTML files.

**Technology Stack**

- HTML5: Semantic markup with responsive layout
- CSS3: Custom styling with grid/flexbox layouts
- JavaScript: Client-side interactivity (map zooming, chart rendering)
- EmailJS: Subscription form handling
- Leaflet.js: Map visualization library

### 4.2 Dashboard Components

Each page functions as a dashboard section:

```
<header>
  <a href="index.html" class="logo"><img
src="https://i.postimg.cc/zX0g8h41/2025-06-13-012731.png" alt="logo"></a>
  <i class='bx bx-menu' id="menu-icon"></i>
  <ul class="navbar">
    <li><a href="index.html">Home</a></li>
    <li><a href="statistics.html">Statistics</a></li>
    <li><a href="farms.html">Wind Farms</a></li>
    <li><a href="investment.html">Investment</a></li>
  </ul>  </header>
```

**Interactive Map Implementation**

Map Initialization (Leaflet.js):

javascript:

```
<script src="https://unpkg.com/leaflet@1.9.4/dist/leaflet.js"></script>
```

**5. Frontend Development and Challenges**

**5.1 Design and Layout Development**

Initial focus was placed on creating a clean, professional look with consistent navigation and footer across all pages.

**Key Features Implemented**

- Responsive layout using media queries
- Unified color scheme and typography
- Clean iconography and visual hierarchy
- User-friendly forms and buttons

**5.2 Technical Implementation Challenges**

**Challenge: Email Subscription Form**

- Problem: Integrating a working subscription system without backend
- Solution: Used EmailJS to send messages directly to email
- Implementation Example:

javascript:

```
<script>
  function sendNewsletterEmail() {
    const userEmail = document.getElementById("newsletter-email").value;

    if (!userEmail) {
      alert("Please enter your email.");
      return;
    }

    emailjs.send("service_oh934wn", "template_qtd1qkf", {
      user_email: userEmail
    })
    .then(function(response) {
      alert("Thank you for subscribing!");
```

```
    }, function(error) {
      console.error("Failed to send email:", error);
      alert("Failed to subscribe. Please try again later.");
    });
  }
</script>
```

**Challenge: Interactive Maps**

- Problem: Displaying wind zones and wind farms visually
- Solution: Used Leaflet.js with custom overlays
- Implementation Highlights:
    - Highlighted regions based on average wind speed
    - Clickable wind farm list for map navigation

**Challenge: Converting Website to Mobile App**

- Problem: First-time experience converting a site into an app
- Solution: Used Median to generate APK file
- Testing Solution: Used BlueStacks to test on PC

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## 6. Server-Side Implementation Details

### 6.1 Static Hosting Setup

Since the project is entirely frontend-based, no server logic or database was used.

**Hosting Configuration**

- Hosted on Netlify
- Files uploaded as a ZIP archive
- Automatic domain assigned
- Continuous deployment via Git not implemented due to simplicity

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## 7. Difficulties Encountered During Project Work

### 7.1 Design Phase Challenges

- Problem: Spent more time than expected designing the layout
- Resolution: Took inspiration from existing clean UI templates
- Outcome: Created a modern, professional-looking website

### 7.2 Mobile App Conversion Issues

- Problem: First-time experience converting a website into an app
- Resolution: Followed tutorials and tested extensively using BlueStacks
- Outcome: Successfully created a functional Android app

### 7.3 Email Integration Limitations

- Problem: No backend meant limited control over email delivery
- Resolution: Used EmailJS which handles form submissions seamlessly
- Outcome: Subscription works reliably without backend infrastructure

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## 8. Lessons Learned During Project Work

### 8.1 Technical Insights

- Learned how to structure and integrate multiple HTML pages
- Gained proficiency in HTML, CSS, and JavaScript
- Understood how to use tools like CodePen, VS Code, and Netlify
- Discovered the importance of responsive design and cross-browser testing

### 8.2 Development Process Insights

- Importance of planning before coding
- Value of iterative development and testing
- How to use third-party libraries effectively (Leaflet.js, EmailJS)
- Understanding of basic web-to-app conversion workflows

### 8.3 Project Management Insights

- Improved time management and task prioritization
- Learned to document progress and challenges systematically
- Developed problem-solving skills through troubleshooting