

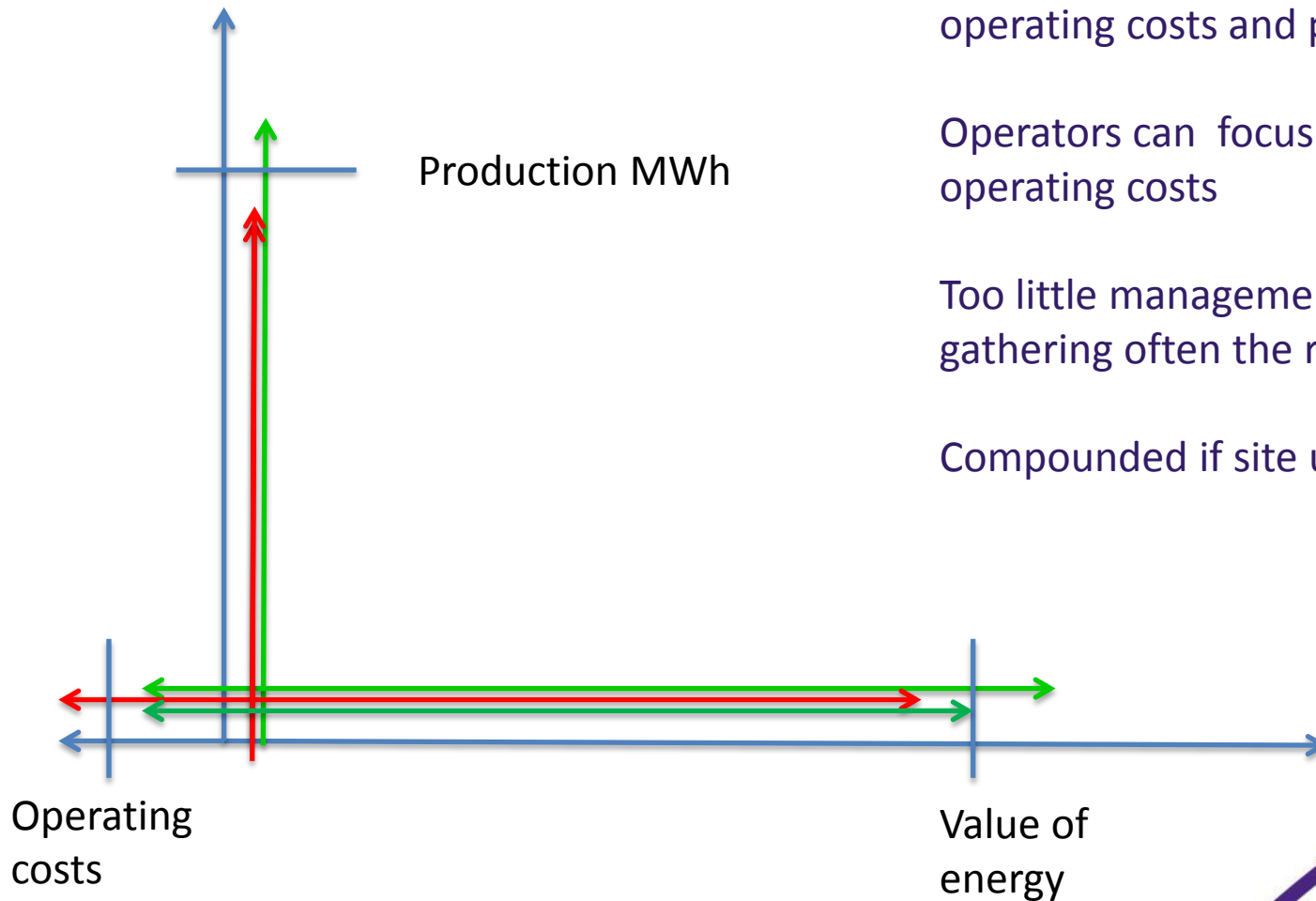


Wind Farm Data – What is it worth?

Introduction to session one

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Wind Farm Operations 101 – What we are trying to achieve!



Relationship Exists between operating costs and production

Operators can focus too much on operating costs

Too little management and data gathering often the result

Compounded if site underperforms!

Key Concerns - Maximizing kWh

- Minimize turbine downtime effecting production (Planned / Unplanned) avoid windy periods
- Minimize HV outages (Planned / Unplanned) avoid windy periods
- Ensure each turbine performs equal to **or better than** power curve
- Minimize lost production related to site access (Weather / Roads)
- Minimize undue delay in management of safety and preparation of work documentation
- Avoid suspended / cancelled work but balance against production
- Avoid shutdowns related to HSE incidents

Key Concerns - Energy Value

- Long term PPA's provide security but at a reduced energy price.
- Increasingly strict penalties/requirements in available PPA's for failure to notify of outages etc. Grid curtailment requirements.
- Some owners now looking at registering in the services market to maximise available revenue streams
 - Constraint payments
 - Voltage
 - Frequency
 - Short term response
- Integration of operations, historical analysis and forecasting data is essential to delivering the most accurate production forecasts and facilitating trading

Key Concerns – Cost of Maintenance

Contract	Efficiency Improvement	Cost Reduction
Turbine Servicing (WOM) <i>Majority of operating costs, costs reduce with longer term commitment 5,10,15</i>	Can use warranty agreement and profit share to positively influence contractor behavior. Can penalize under warranty claiming LD's.	Good negotiation (competitive bid) Independent O&M In House O&M
Balance of Plant maintenance <i>HV system, roads and other infrastructure maintenance contracts</i>	Unless part of turbine package typically no availability penalty. Individual contracts for maintenance insurance	Competition in market place exists but quality varies, good management to reduce cost.
Asset Management <i>Health, Safety, Monitoring, Management and reporting. Back office.</i>	Unless part of turbine package typically no availability penalty. Can complain, exit contract.	Several AM companies in the market place to choose from. Don't accept the developers operation without competitive comparison.
Other outgoings	Grid Insurance etc	Minimal ability to vary, low impact

Management = Measurement = Understanding

The road to improved site performance is through operational data but if you don't gather the data for yourself then you may be on the wrong track!

- How do you gather your own data?
- How do you use it to challenge the performance of contractors?
- How do you use it to work with contractors in planning maintenance activities?
- How do I understand where the real causes of underperformance lies?



Data available to gather

Personnel Information

- Competence
- Authorization
- Induction dates
- Contact details
- Vehicle Details
- Site access time
- Site egress time

Work Order Data

- WO Completed
- WO Planned
- WO Overdue
- WO Ongoing
- Completion time
- Parts Used
- Service Report #

Plant Item History

- WO
- Handover
- Who / When
- Return
- Who / When
- Operational Restrictions

Marine Management

- Wave height
- Tidal conditions
- Vessel move'nt
- GIS locations
- Water depth
- Vessel Capability
- Vessel Availability

Production Forecasting

- Forecast weather,
- Expected production @100%
- Next 7 days at expected %Av
- Turbine specific

Performance Data Analysis

- Actual MWh,
- Max possible MWh
- Downtime
- Penalty / Reward
- Comp with WOM

Safety Documentation

- Method Statement
- Risk Assessment
- PPE Information
- AWP
- Lifting plans
- etc

Offshore Personnel Information

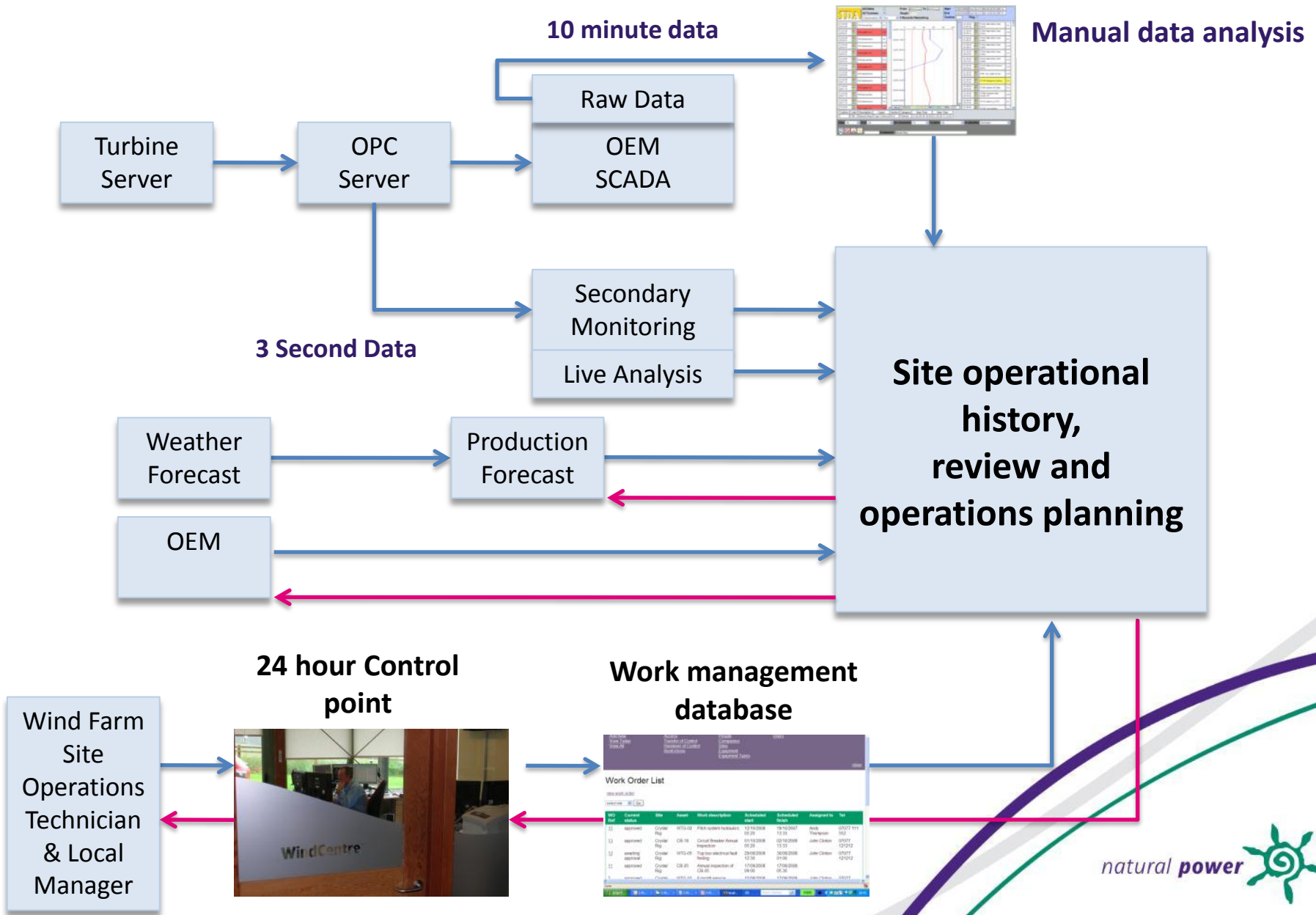
- Marine training
- Location tracking
- MO Beacon

Monitoring & Analysis

Operations Management

Marine Management

Possible data gathering structures



Central Control Rooms – Getting yourself in the loop

1. Manage H&S interaction
2. Gather data on operations for reference
3. Be a single point of contact



- Call centre functionality 24/7
- Ability to manage multiple work on multiple sites, various turbines
- Record and control all site access
- Transfer control of plant
- Prepare and manage Work Orders
- Record all work activity
- Monitor Weather Conditions
- Emergency control point (plan holder)
- HV control point, system controller
- Facilitate local site management team
- Prepare daily / Weekly report
- Turbine resets & Monitoring
- Portfolio SCADA Monitoring

Wind Farm Data – What's it worth?

- For H&S literally, life and death – Priceless
- Realism and understanding not blind faith in EYA
- Power to control your own assets and challenge OEM behavior
- Ability to plan production / maintenance
- Reduce ongoing maintenance costs and increase production
- Possibility to trade and increase energy value
- Ability to gain more competitive quotations – Reduced contractor risk
- Possibility to sell a site at higher value DD – Reduced buyer risk

Its worth EVERYTHING