Black Start Review and Exercise Programme

The Review:

Summary of the Report to the Energy Emergencies Executive

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Engagement with industry and HMG departments

All electricity supply industry (ESI) participant companies, and their Trade Associations, have been fully supportive of the measures taken to enquire into capability and to examine opportunities for improvement. Government departments have demonstrated a keen (and growing) interest in the issues associated with Total Shutdown and Black Start, in the context of their own contingency planning arrangements.

All Black Start participant companies collaborated in the completion of a detailed questionnaire on capability (on the basis that the confidentiality of individual responses would be protected). In addition to disclosing variable capabilities, completion of the questionnaire has caused companies to identify opportunities for introducing improvements in procedures and facilitation.

Existing Black Start Plans and ESI capability

The existing approach to Black Start is sound in concept, but prospective performance is jeopardized by:

- Weaknesses in process arrangements, particularly at locations subject to activity overload and at the power station/distribution network operator interface. ⓘ 2006 - improvements are noted as a result of Exercise Phoenix.
- Dependence by ESI companies on a range of telecommunications services of uncertain resilience. ⓘ 2006 - a joint DTI/ESI group is reviewing telecommunications resilience.
- Uncertainties about the availability of gas supplies to gas-fired power stations following Total Shutdown.
- Uncertainties about the performance of supervisory control and data acquisition (SCADA) systems.

Return to normal times

Reasonable target time for resumption of unconstrained electricity supply to all customers has been established as 48 hours in summer and 72 hours in winter (subject to the absence of underlying asset damage requiring long repair time).

Sequence of restoration

The strategy of seeking to re-energize the Great Britain transmission system as quickly as possible, to enable power station interconnection, has been validated. This provides for the broadly concurrent development of up to seven power zones, each serving major conurbations. The technical characteristics of small Black Start capable hydro power stations in Scotland means that the first restorations are likely to occur there; but sustained restoration of the country as a whole would be jeopardized if a focus was placed on accelerated restoration of any particular conurbation, including London, bearing in mind that the south-east as a whole requires infeed from remotely located sources of generation.

Opportunities for improvement

Insofar that the over-arching approach to Black Start, and the national availability and disposition of Black Start power stations, is considered sound, it is nonetheless evident that Black Start capability has been (prior to Exercise Phoenix) relatively poorly understood in some parts of the industry, and **the most effective area for improvement lies in the regular review, development, and practice of processes and procedures**. Other opportunities are associated with introduction of more demanding performance standards for auxiliary systems e.g. substation batteries, telecoms systems, etc.

Investment proposals

Black Start recovery process: BSTG has not identified opportunities for major capital investment by any of the Black Start participant companies. However, reinforcement of second-order systems (e.g. resilient telecommunications and SCADA systems, and information systems serving the needs of HMG departments, the media and the public) would improve overall Black Start capability.

Primary fuel supplies: It may yet arise that following further analysis of gas production and delivery capability, in the circumstances of GB Total Shutdown, justifiable opportunities for capital investment will be identified in the up-stream gas supply chain i.e. provision of greater resilience at gas terminal sites.

Consequences arising from Total Shutdown

Although not a primary objective of the Black Start Review and Exercise Programme, engagement with other HMG Departments and public service agencies has featured prominently. It has become evident that there are fundamental weaknesses in the perception of not only the national consequences arising from Total Shutdown (and therefore weaknesses arising from any wide-area and prolonged power outage), but also in the capability of the ESI in recovering from such conditions.

Exercise Phoenix

All Black Start participant companies contributed to the delivery of over 100 separate preparation and exercise/training modules, at multiple locations around the country, during spring 2006. About 1,100 man-days of commitment were registered, and the salary costs of preparation and delivery exceeded £0.5 million. This has been a remarkable example of pan-industry collaboration, without recent precedent.
The conclusion of Exercise Phoenix in May 2006 adds confidence to the belief that the Great Britain ESI is capable of conducting a successful Black Start recovery from Total Shutdown. Present capability has been reinforced by the close attention paid to the Black Start process by participating companies, in consequence of both the Review and the Exercise parts of the Programme.

A full report on Exercise Phoenix has been produced as a companion document to this Review report.

Further work needed

At the tactical level: Many opportunities were identified during Exercise Phoenix for improvements at a tactical level: these measures have been, or will be, adopted by participating companies according to local circumstances.

At the strategic level:

1 **Governance**: the development and introduction of a more robust approach to the governance of the Black Start process.

2 **Telecommunications**: Development of an objective understanding of the resilience of national telecommunication systems in conditions of electricity Total Shutdown, leading to the specification of standards of performance appropriate to national need.

3 **Gas supply**: Analysis of the inter-dependence of public electricity supply and national gas production, import, terminal site operation, treatment, delivery and storage arrangements.

4 **Investment**: Identification and specification of selective improvements in SCADA and substation auxiliary systems.

5 **Consequence identification and management**: Delivery of comprehensive guidance on electricity supply arrangements to enable other key public service providers (including HMG Departments) to better understand the measures they should adopt as a part of their business continuity planning processes, and to support their compliance with the provisions of the Civil Contingencies Act 2004.

Table of Recommendations and actions

#	Recommendation	Commentary	LEAD, report to …	Target Delivery Date
1	**Governance**			
1.1	Introduce comprehensive prescriptive arrangements for pan-industry process review, documentation, training & practice	Grid Code Review Panel to develop revisions giving sufficient scope to the System Operator to superintend the capability of Black Start participant companies.	NGET Report to E3	08/2007
1.2	E3 to encourage participant companies to include Black Start capability in corporate risk reporting process.	Evidence of Black Start capability is a matter of national importance.	E3 Report to SoS	10/2006
2	**Telecommunications**			
2.1	Establish objective measurement of the resilience of public and private telecommunications systems used by the GB electricity and gas companies, spanning off-shore gas production to gas and electricity delivery to customers.	This work has already commenced via the E3C Electricity Task Group. It is particularly important that this work receives sustained support by DTI and co-ordinates with the requirements of the Cabinet Office.	DTI Energy Group Report to E3	10/2006
2.2	Bring forward recommendations on improvement, replacement, or alternative systems providing resilience fit for purpose.	This work should include a review of the status of key telecommunications, gas & electricity operational sites, and the specification of the telecommunication facilities between key sites.	DTI Energy Group Report to E3	01/2007
3	**Gas**			
3.1	Undertake analysis of the inter-dependence between electricity System Operator and gas transmission control arrangements, and of electricity supply and national gas production, import, terminal site operation, treatment, delivery, and storage arrangements.	This work is partially underway within the National Grid Company, the E3C Gas Task Group, and DTI, but without sufficient co-ordination. It might be found that analysis capability is beyond the capacity of individual businesses, and external skills may have to be procured.	DTI Energy Group Report to E3	12/2006
3.2	In anticipation of results from 3.1, develop a policy on gas terminal resilience in the context of multiple site	In the national interest, and in the context of concurrent electricity supply failure to multiple terminal sites.	DTI Energy Group	03/2007

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	electricity supply failure.		Reports to E3	
4	**Investment**			
4.1	Develop specifications for minimum standards of transmission system control centre and substation auxiliary resilience.	To include proposals for a programme of remedial work, with evidence of projected expenditure incurred to complete.	NGET Reports to E3	03/2007
4.2	Develop specifications for minimum standards of distribution network control centre and substation auxiliary resilience.	Ditto	ENA OSG Reports to E3	03/2007
5	**Consequence identification & management**			
5.1	Develop and activate a programme of delivery of comprehensive guidance on electricity supply arrangements to key public service agencies (inc. HMG Departments)	To enable better grasp of the measures to be adopted as a part of the business continuity planning process, and to support compliance with the provisions of the Civil Contingencies Act 2004.	E3C ETG & CTG Reports to E3C & E3	08/2006