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Finance, Engineer, Lease and Transfer (FELT) – An innovative alternative for development of Hydro

Abstract

Since the early 1990s efforts to mobilise private sector finance for hydro development have focused on Build, Operate, Transfer (BOT), Build, Own, Operate, Transfer (BOOT) and other similar variants. Whilst successful for thermal power, these models have proved largely unsuccessful for hydropower. An alternative model is therefore proposed which attempts to address the drawbacks of the BOT/BOOT structure when deployed for hydropower. The proposed Finance, Engineer, Lease and Transfer (FELT) model enables control of the scheme parameters to remain with the government owned entity, reduces up-front expenditure and risk for the Developer, equitably allocates project risk, enables the government owned entity to access all energy and ancillary benefits of the project and provides a secure revenue stream for the Developer. A key objective of the model is to disassociate revenue relating to provision of the facility from energy supply and O&M services. The FELT model is suitable for conventional energy priority hydro, and is particularly appropriate for the emerging requirement for grid-supporting flexible hydro and pumped storage schemes. Looking forward it will be increasingly important for hydro schemes to make full use of the resource potential of the site, and to be configured for maximum benefit to the power grid. FELT enables these objectives to be achieved.

1 Background

In 2017 we are at a time where there is an increasing need for hydropower:

- Falling fossil fuel prices are encouraging utilisation of thermal generation with increasing greenhouse gas (GHG) emissions.
- Increasing penetration of intermittent renewables is starting to cause grid stability and security issues on many systems.
- The nature of demand is changing, with growing dependence on secure and stable power supply, meaning an increased need for firm peaking capacity.

Hydropower is the only large-scale despatchable renewable technology, and is uniquely able to address many of these issues. Hydropower is no longer just required for cheap energy; flexible storage hydro and pumped storage are increasingly required for grid support and for integration of other renewables. Since there is a limited number of good hydropower sites, it is imperative that sites are developed for the optimum benefit of the nation and the electricity grid, and are not just configured to maximise investor returns.

Although it is capital intensive, the problem for hydro is not shortage of funds. There is plenty of finance available for infrastructure investment, with investors seeking alternatives to the low returns available on deposits and secure financial instruments. The problem is that the prospective reward typically does not balance the risk.

Now is the time to capitalise on the low cost of finance to develop the world's hydroelectric infrastructure to electrify large tracts of the developing world, and to provide security for national power grids. The FELT model provides one option for achieving this as an alternative to the BOT/BOOT structure, that is failing to stimulate development of hydro.

2 The Issues

The traditional BOT/BOOT model is generally unloved.

- Governments and utilities dislike it as they lose control of the development process and can end up paying high tariffs for a project that does not suit their needs.
- Developers dislike this model because of the high front-end risks and the enormous time and effort needed to bring a project to fruition. The risks need to be balanced by high prospective returns, and the resultant high tariff requirement can render projects unviable.
- International Financial Institutions (IFIs) dislike BOT/BOOT as their role is diminished, typically supporting the government concessionaire. This has been partly addressed by the private sector arms of IFIs such as IFC, with their enthusiasm for participation in projects.
- Lenders dislike BOOT because of the lack of security of the revenue stream. Even the most "lender friendly" versions of BOOT present long-term risks to debt service.
- Regulators dislike BOOT as they cannot ensure the project is designed and operated to meet the needs of the power system and find it hard to ensure timely implementation of projects.

Is it any wonder that it is hard to close a BOOT deal?

The lack of success of BOOT for hydropower in developing countries is illustrated by the recent World Bank Report on IPP in Sub-Saharan Africa (World Bank Group, 2016) , where a total of 81 Independent Power Producers (IPPs) were identified in 17 countries in the region outside South Africa. Of these only two are large hydro (>50 MW): Bujagali (250 MW) and Itezhi-Tezhi (120 MW). This compares with 39 IPP thermal powerstations with 5880 MW aggregate capacity in the same 17 countries. The REFIT programme in South Africa successfully mobilised some 2000 MW each of wind and solar generation, but only 21 MW of hydro. Other than in Uganda, where REFIT/GET FiT has stimulated development of several small hydros, only two other hydro IPPs with combined capacity of 31 MW, in Angola and Madagascar, are listed as achieving financial close in recent history.

So what is the alternative? Up until now there has not been a model, other than traditional public sector procurement, that satisfies most of the parties. However it is recognised there is insufficient public funding available to construct the infrastructure needed in developing nations, let alone cover the requirements for health, education and other social expenditure on which it is harder to deploy private finance. It is also considered that the private sector can bring skills and efficiencies to the development process that may not be available in the public sector.

BOOT is clearly not working for hydro in the parts of the world where it is needed most. The author has attempted to define an alternative model to mobilise private finance and development skills that goes a long way towards satisfying all parties.

3 The FELT Model

The FELT model is a public private partnership (PPP) mechanism that is remarkable for its simplicity:

- The public sector organisation (PSO) carries out all of the project preparation studies, specifies the design requirements, obtains licences and clearances and brings the project to "shovel-ready" status, at which time it procures a Developer.
- The selected Developer finances and "engineers" (i.e. designs, constructs, supplies equipment and commissions) the specified project. On completion the project is handed to the PSO to use in return for a defined annual payment for the period of the lease term. At the end of this term, ownership of the facility is transferred to the PSO.

Under the FELT model the Developer is the Lessor and the PSO is the Lessee.

3.1 Role of Government

A key to the success of the FELT model is the need for a strong and creditworthy PSO. In theory this could be an existing utility or power corporation such as Eskom, NHPC or WAPDA. However in view of the need for the obligations of the PSO to be underwritten by guarantees from the IFIs, it is necessary for their finances to be transparent, and preferably not complicated by historic baggage or by retail delivery and revenue collection risks. Hence a new organisation is envisaged, even if it is a subsidiary of an existing power company.

It is expected that many PSOs will not have the finance, skills and resources to bring a project to the "shovel-ready" stage. Financial support will be required from development banks and donor agencies to fund feasibility studies, environmental and social studies, procurement and professional advisors. Some strengthening of these PSOs through recruitment of key staff, training and technology transfer may also be required. A summary of the activities of the PSO are shown in the timeline in Figure 1.

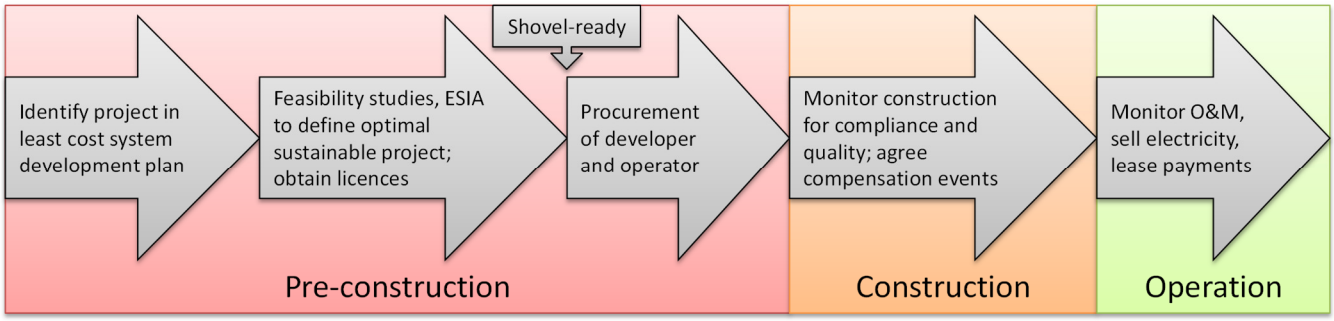

Figure 1: Activities of PSO

3.2 Role of Private Sector

Under the FELT model the private sector only becomes involved when the project is "shovel ready": that is when technical and environmental studies are complete, the scheme is defined, licences, permits and approvals have been obtained and the PSO has arranged the security package to

underwrite its obligations. At this point the FELT contract is tendered among suitably qualified consortia.

Competing consortia submit tenders for the FELT contract on the basis of the lease terms. Following adjudication the selected consortium is called to negotiate. It is important that the resulting contract defines the project to be delivered and the performance tests precisely in order to avoid introducing compensation events during construction.

The Developer arranges finance, designs, constructs, installs equipment and commissions the project, and on completion hands the scheme over to the PSO for operation. A summary of the Developer's activities is shown in Figure 2.

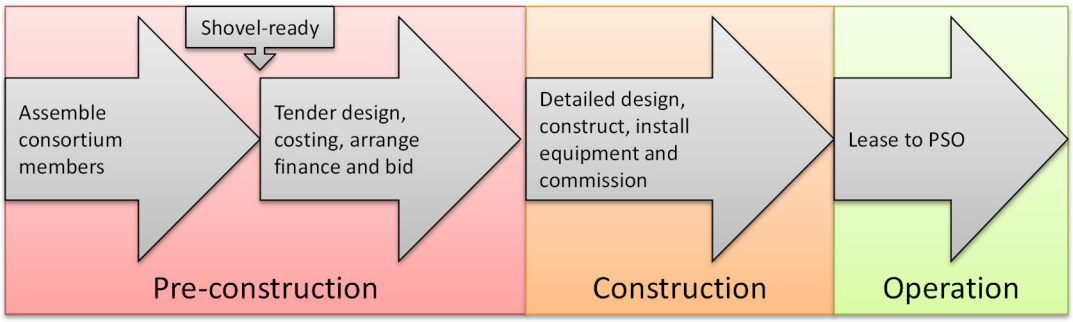

Figure 2: Role of Developer

3.3 Role of International Financial Institutions

In the developing world, where it is envisaged that FELT will be most widely deployed, IFIs are likely to play two key roles:

- Contributing towards funding of the front-end studies and monitoring of construction;
- Underwriting the lease payment obligations of the PSO.

Mechanisms such as the Hydropower Preparation Support Facility, which is designed to ensure the optimal design and development of hydropower schemes, are likely to be required to enable the PSO to bring the projects to market.

In some cases the IFIs may support the formation and training of the PSO, which may be a good investment to reduce the likelihood of the underwriting guarantees being called.

Underwriting of the PSO's lease payments by IFIs (either bilateral or multilateral) is key to the bankability of FELT in all but the most robust economies. Security of the lease payment stream is a pre-requisite for the success of FELT, since the Developer has limited ability to derive alternative revenue from the project (it cannot be moved elsewhere).

The arrangements put in place to secure the funding of the lease payments would be agreed with the IFI providing the guarantee, and may include escrow accounts and reserves.

4 Comparison of BOOT and FELT Structure

Comparisons of the organisation structures under BOOT and FELT models are shown in Figure 3 and Figure 4.

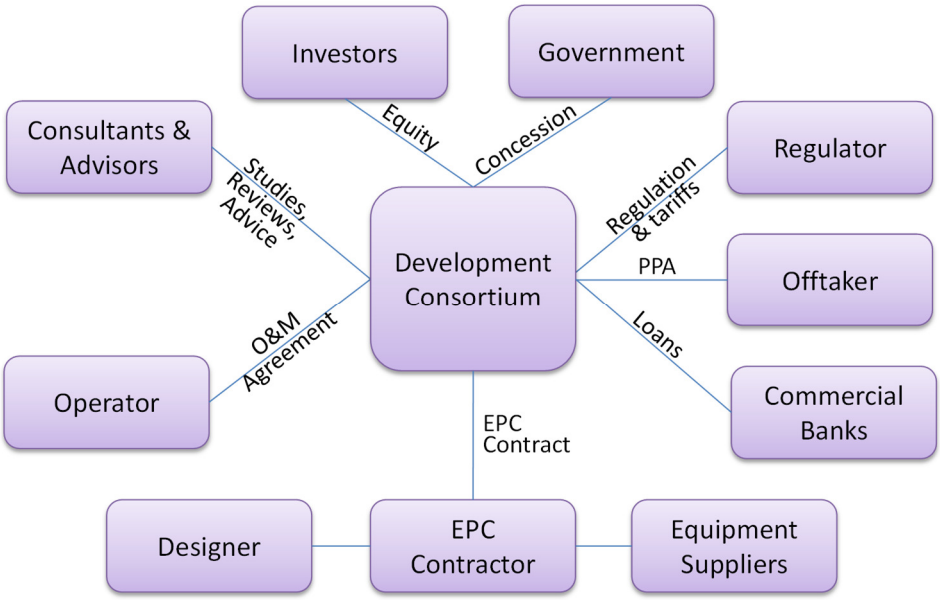

Figure 3: Typical IPP BOOT Structure

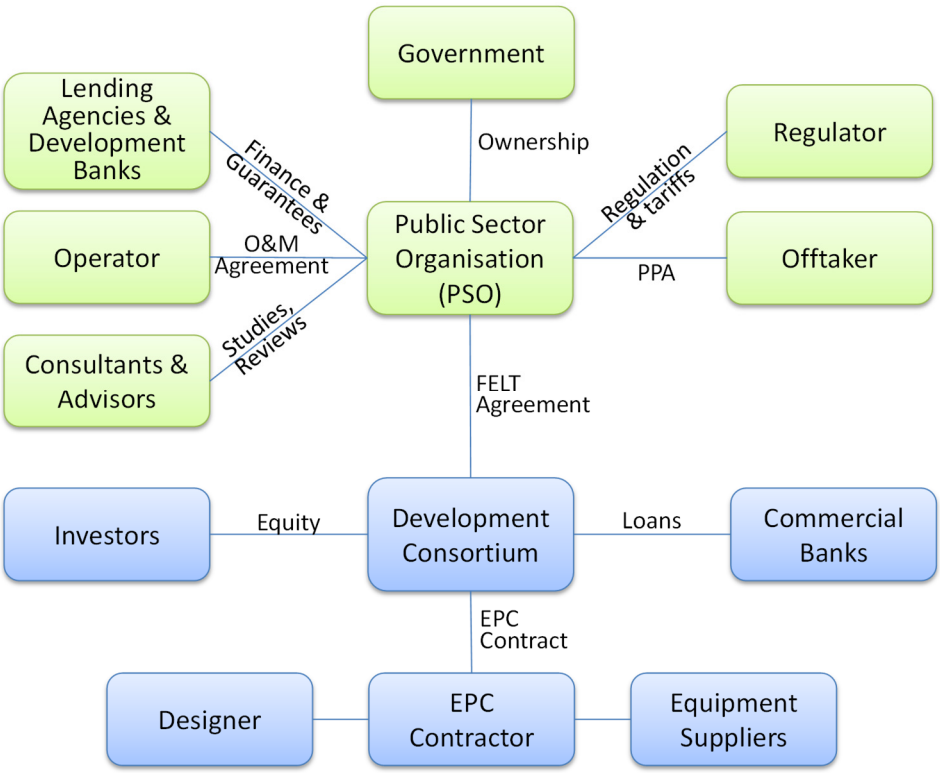

Figure 4: Typical PPP FELT Structure

Under the BOOT structure the Developer is the counterparty for all of the major contracts (Concession Agreement, PPA, EPC Contract, Finance Agreement, O&M Agreement) and hence participates in the risks under each of these agreements.

In the FELT model the Developer is counterparty to the FELT Agreement, Finance Agreement and EPC Contract. The Government owned PSO is the counterparty to the FELT Agreement, Concession (if required), PPA, O&M Agreement and to Finance and Guarantee Agreements with the IFIs. This inherently reduces the exposure of the Developer.

5 Allocation of Risks and Responsibilities

The objective of the FELT model is to virtually eliminate the front-end (i.e. pre-financial close) risks to the Developer, other than those associated with bidding for the contract, and to eliminate as far as possible the long-term risks to the Developer apart from those associated with financing. The construction stage risks remain with the Developer other than those associated with specification of the project and unexpected ground conditions. Since the PSO selects the site and undertakes the feasibility studies including ground investigation, it is reasonable that the PSO carries the risks associated with ground conditions.

The suggested allocation of risks under the FELT model is shown in Table 1 compared with the typical allocation under BOOT. This allocation may be modified to suit the particular project, regulatory environment and general level of risk, although for the model to be effective the allocation shown for the operating stage should generally be maintained.

Table 1: Comparison of Risk Allocation between BOOT and FELT

Risk Description	***Allocation***	
	BOOT	***FELT***
Development Phase (up to Concession Award / Financial Close)		
Feasibility Study, System Analysis	Developer	PSO
Environmental and socio-economic studies	Developer	PSO
Project Clearances and land acquisition	Developer	PSO
Conceptual design and Owner's Requirements	Developer	PSO
Developer's priced proposal (and further technical and commercial studies, completeness of BOQ, accuracy of pricing, inflation and IDC estimates)	Developer	Developer
Arranging finance	Developer	Developer
Finalisation of concession and contracts	shared	shared
Construction Phase (Financial Close to Start of Commercial Operation)		
Detailed design	Developer	Developer
Construction efficiency and performance	Developer	Developer
Equipment design and installation	Developer	Developer
Equipment performance	Developer	Developer
Compliance with Owner's Requirements	Developer	Developer

Risk Description	***Allocation***	
	BOOT	***FELT***
Quality, Health, Safety and Environmental compliance	Developer	Developer
Unforeseen geological conditions	Developer (tariff adjustment in some concessions)	PSO
Hydrological parameters for temporary works	Developer	Developer
Hydrological design parameters (other than for temporary works)	Developer	PSO
Environmental and resettlement measures	Developer	PSO (can be included in contract)
Transmission line and interconnection	Varies	PSO (can be included in contract)
Operating Phase (from Commercial Operation date)		
Performance of scheme in accordance with specification	Developer	Developer (for warranty period)
Energy output (due to varying hydrology)	Developer	PSO
Availability of plant (due to quality of equipment)	Developer	Developer (for warranty period)
Availability of plant (due to operation and maintenance)	Developer	PSO
Sale of energy	Developer	PSO
Operation and Maintenance	Developer	PSO
Finance during operating phase	Developer	Developer

6 How does it address the challenges of BOOT?

The FELT concept has been developed to address as many as possible of the challenges that are inherent under the BOOT model. FELT is not a universal panacea for all hydropower developments, and it is not possible to eradicate all project risks. Some of the challenges are dealt with in more detail in the Q&A section of Appendix A of this paper, and a summary is presented in Table 2. Some of the challenges shown can be accommodated under BOOT if appropriate controls and regulations are in place, particularly if revenue is predominantly based on capacity rather than energy. However, under FELT the PSO can make all the decisions regarding the configuration and operation of the scheme, facilitating this control.

Table 2: Summary of BOOT Challenges addressed by FELT

ID	Challenge	FELT Solution
1.	Scheme is not a priority on the least cost system development plan.	Under FELT the government can select schemes and develop them in the order and timing to suit the least cost system development plan.
2.	Scheme sizing and load factor is not optimal for power system.	The PSO defines the scheme parameters to suit the needs of the power system.
3.	Storage is not provided to suit system requirements	If storage is required and is feasible, the PSO can define the scheme with reservoir storage.
4.	Scheme is not configured to provide ancillary services (inertia, rapid response, black start etc)	The PSO can define all the performance parameters and characteristics to provide system support and ancillary services.
5.	Nation does not wish to lose control and ownership of the unique hydropower resource	Under FELT the resource and the land on which the scheme is constructed remains in the ownership of the nation (or under its existing ownership). The facilities (buildings, dam, waterways and equipment) are owned by the Developer until transferred to the PSO at the end of the lease term.
6.	Lack of appetite for the concession from developers and lenders	There appear to be enough developers in the market, but the risk-reward profile does not encourage them to participate. FELT redresses the risk-reward balance and should encourage more widespread participation.
7.	Scheme includes social or multipurpose components that are not commercially viable	Social and developmental funding can be provided to the PSO, either from government sources or IFIs, to augment revenue from electricity sales, in order to cover the lease payments.
8.	Long gestation period for hydro requires high prospective return on investment.	Without significant up-front expenditure, the need for high risk early stage venture capital from the Developer is eliminated, and his required rate of return should be significantly reduced.
9.	IPP hydro projects have a high capital cost.	FELT does not significantly reduce the cost of construction. However the overall capital cost of IPP hydro is inflated by the cost to the Developer of potential risk, and the cost of debt finance is heavily influenced by risk. Reducing the Developer's risk means lower lease payments. If risks materialise the PSO will have to cover them, but it benefits from the upside if the risks do not materialise.

ID	Challenge	FELT Solution
10.	Difficulty in finding bankable credit-worthy offtaker	Many potential offtakers are distribution companies suffering from low tariffs, high losses (technical and power theft), revenue collection dificulties and inefficient distribution networks. Industrial and mining companies may have higher credit ratings, but often do not have the ability to sign long-term PPAs. The PSO, with support from the IFIs can operate as a merchant supplier and spread risk among multiple projects and offtakers. With the payment obligations of the PSO underwritten by IFIs, the Developer is insulated from the creditworthiness of the final offtakers.
11.	High construction and operation risks increase cost of finance.	With a price reopener mechanism for subsurface conditions, and with a guaranteed revenue stream following completion, the risks to the Developer are reduced. This should be reflected in reduced debt interest rates and equity returns.
12.	Government licences and approvals outside control of private developer	The PSO is responsible for licences and approvals. It is envisaged that planning and environmental studies will be carried out to meet the requirements of the IFIs; intra-government relations should speed approvals.
13.	Power revenues tend to be in local currency whereas many construction costs are in foreign currency	This is one area where FELT does not yield a significant solution, as it is envisaged that most developers will incur foreign debt and require forex payment. Hedging and other revenue protection is still required.
14.	Climate change introduces uncertainty about accuracy of historic hydrological records	The hydrological studies on which the energy output and key scheme design parameters are defined are carried out on behalf of the PSO, who therefore carry responsibility for this aspect. There may be aspects of hydrology for which the Developer's EPC contractor carries some responsibility, such as temporary works and drainage; the design parameters will be agreed with the PSO in a similar manner to conventional EPC contracts.
15.	Benefits of the project accrue elsewhere (eg the new scheme may reregulate the flow of an upstream project enabling the upstream project to be operated in peaking mode, or enhance the output of a downstream scheme)	The PSO assesses these issues in its feasibility studies and may establish mechanisms to monetise these benefits. This is most easily achieved if the PSO is owner or lessee of the scheme(s) where the benefits accrue.
16.	Electricity demand growth may not match the forecast	The PSO has the ability to sell electricity to a variety of markets including national utilities, private entities and foreign entities, subject to infrastructure availability, national regulations and agreement with the IFI backers.

ID	Challenge	FELT Solution
17.	Market does not allow full monetisation of output (eg no time-of-day tariff, no market for ancillary services)	Being owned by the government, the PSO would be expected to define and operate the scheme for optimal national benefit, irrespective of whether the benefit can be monetised.
18.	Term of revenue contracts do not cover debt service term	A key aspect of FELT is the flexibility available to the PSO to sell products and services from the scheme (energy, capacity, water supply, ancillary services) etc to other entities through a variety of contracts ranging from the spot market to long-term PPAs. The underwriting IFIs will need to be satisfied that the revenue stream will support the lease payments, or arrange for financial support for social components of the scheme.
19.	Scheme should be constructed with greater empathy for the environment	It is expected that all hydropower projects would be constructed in compliance with national legislation and, where appropriate, international guidelines. However there may be situations where environmental impacts can be further mitigated or enhancements achieved at the expense of commercial revenue (eg releasing more flow, reducing the dam height etc). FELT facilitates this approach.
20.	Unexpected ground conditions occur, increasing cost and delaying completion	Under the FELT model the site is selected and ground investigations are undertaken at the feasibility stage on behalf of the PSO, and it is therefore appropriate that the PSO takes responsibility for the risk associated with ground conditions. It is envisaged that a geological baseline report (GBR) is adopted as part of the FELT contract in a similar manner as is becoming common in EPC contracts. If actual conditions vary from the GBR (either better or worse) appropriate adjustments are made to the lease payment and completion date.
21.	Power system operator has little control or visibility of completion date	Under BOOT and other current models, the public sector often has little visibility of the progress towards commercial operation. This is particularly true for the development phase prior to financial close, but is also the case during construction. Under FELT the public sector has full control of the development phase, and has a comprehensive monitoring role during construction providing full visibility of progress.
22.	Scheme not commercially viable but needed for system support or to meet future demand	The value of “energy-not-served” (i.e. the cost of power outages) is never reflected in the tariff for IPPs. This value, which can be upwards of $10/kWh, is politically and commercially difficult to cover in a PPA. FELT provides a means for governments to implement such “system-support” schemes using private sector finance.

ID	Challenge	FELT Solution
23.	Scheme should be operated with greater empathy for the environment	As with environmentally sympathetic design, it may be in the national interest to operate schemes with greater empathy for the environment than required by national legislation. FELT provides a model to facilitate such operation.
24.	Multi-purpose demand for water potentially reduces energy production	It is often difficult to monetise the non-energy benefits of multi-purpose schemes. Irrigation, flood control, water supply, navigation, water quality and other benefits can be evaluated through economic analysis, but it can be difficult to extract a commercial revenue stream from them. FELT allows an easy route to channel income or social funding to the PSO to cover the lease payments.
25.	Cascade issue affects timing and quantum of generation.	Upstream interference with flow, and requirements for releases to meet downstream criteria can affect the commercial viability of economically sound schemes. Under FELT, schemes which satisfy criteria for economic viability (evaluated on cost-benefit to the nation) can be implemented.
26.	Conjunctive operation of scheme with other assets reduces energy production	The issues of conjunctive operation are similar to those of cascade operation, although the schemes need not be on the same river or even the same technology. Conjunctive operation of storage hydro (conventional or pumped) with renewables, can facilitate increased renewable penetration on the grid; conjunctive operation of hydro and thermal can improve thermal efficiency and reduce operating costs. FELT facilitates such operation.
27.	Scheme will change during concession term affecting production	Schemes have been proposed where a change in head will occur part-way through the IPP concession period (eg at Inga 3) or where it would be optimal to phase development (additional capacity or regulation added later). Under conventional IPP arrangements this can be complex, but under FELT such changes can easily be accommodated.
28.	Abstractions or transfers upstream will affect generation	Future changes to water flow due to abstractions or upstream transfers (either depletions or accruals) can be difficult to accommodate under conventional IPP models. FELT isolates the Developer from such future changes. The PSO can make provision for such changes, which may require changes to the mode of operation (eg from base-load to peaking).

ID	Challenge	FELT Solution
29.	Operational risks (eg equipment failures, sediment and trash problems) can affect revenue str	Under BOOT-type IPP concessions issues arising from scheme operation and maintenance can affect the revenue stream required for debt service. This is a major issue for commercial lenders who require repayment certainty. By separating the payment for the provision of the facility from operation and maintenance, FELT allocates revenue more appropriately, and provides the certainty required by the debt providers.
30.	Climate change introduces uncertainty about future energy generation	Climate change is an issue outside the control of the Developer, and there is no rational reason for the Developer to carry climate-change risk. The government will typically have multiple assets affected to varying degrees by climate-change, and under the FELT model can spread the risk of future climate impacts.
31.	Transmission line to evacuate power may not be completed on time	Unless the transmission interconnection forms part of the project, its completion will typically lie outside the control of the Developer. Even if it forms part of the project, the most common reason for transmission delays is wayleave acquisition, which is a risk more easily handled by the government. Under FELT the transmission is either removed from the project or, if included, wayleave provision and environmental issues are the responsibility of the PSO.
32.	Transmission lines and electricity grid may not be available or able to cope with the generation	Under the FELT model the Developer is not responsible for transmission line availability. The PSO either carries this responsibility or transfers it to third parties.
33.	Operation of power grid can adversely affect generation	Trips, transients and disconnections can result in outages or damage to the hydro scheme. Under FELT such issues, which are outside of the control of the Developer, do not have any impact on the lease payments.
34.	Reputational risk and transparency	Under existing IPP arrangements it is not always clear that a project has been awarded with transparency at all levels, and that it has been appropriately scrutinised for environmental, social, climate change and other sustainability criteria. Hence concerns may arise over ethics, sustainability and reputational risk for the participants. Under the FELT model there can be reasonable certainty, through the participation of the IFIs, that the project has undergone appropriate scrutiny and review, which can provide assurance to the project participants.

Although for each of the challenges above, the transfer of risk and responsibility away from the Developer is presented as an advantage, it will be perceived by some that such transfer is not advantageous, particularly to the government. However it is recognised that FELT is not a universal panacea for IPP hydro development, but has been conceived to encourage private funding of projects that are difficult to implement using the existing IPP models. This shift of risk is deliberate in order to improve the risk-reward profile of the project without increasing the cost of the project.

For less difficult projects where market conditions, the regulatory environment or the security of revenue mean that mobilisation of private finance is only just out of reach, not all of the risk transfer needs to occur. However disaggregation of the delivery of services (supply of energy and operation) from provision of the facility should be preserved to maintain the integrity of the FELT concept.

7 Which projects are suitable for FELT

There are a range of reasons why FELT may be adopted. Although FELT is not exclusively suited to hydroelectric projects, the focus of this paper is on hydropower. Other technologies and types of project are considered in the Q&A discussion in Appendix A.

The list in Table 3 is not exclusive, but indicates some of the types of hydropower projects that may be suited to FELT development, and the particular reason why FELT is appropriate.

Table 3: Types of Hydropower Project that may be suitable for FELT

ID	*Type of Hydro Project*	*Reason for using FELT*
1.	Hydro project with storage reservoir	Storage reservoirs are of great value to power system operators. While the economic benefits to the system of storage can be assessed, it is difficult to monetise this through energy sales. Capacity payment (i.e. for MW rather than MWh) can address this, but under FELT the PSO can define precisely the scheme required for optimum system benefit, and operate it for maximum value to the system.
2.	Pumped storage project	While there is growing need on many power systems for pumped storage, the traditional arbitrage (buy cheap/sell expensive) is under threat from developments such as smart grid and electric vehicles, and it is becoming harder to finance pumped storage projects on a commercial basis. FELT enables the government to develop pumped storage schemes to support the power grid using commercial finance.
3.	Peaking (low load factor) hydro scheme	Peaking hydro schemes are optimised to provide capacity, and the equivalent energy cost tends to be high. While capacity payment based BOOT concessions could in theory address the high cost of energy, by de-linking generation from payment completely, FELT is likely to be easier.

ID	Type of Hydro Project	Reason for using FELT
4.	Flexible Hydro	Flexible Hydro schemes are designed specifically for grid support, providing ancillary services that are increasingly needed to integrate intermittent and predictable renewables. Even in the most sophisticated electricity markets it is proving difficult to define mechanisms that will ensure that new hydro is configured for optimum grid benefit. FELT enables the PSO to design and operate schemes specifically for grid support.
5.	Multipurpose scheme (hydro, irrigation, flood control)	Schemes which are constructed or operated to provide benefits which do not easily yield commercial revenue are difficult to implement on an IPP basis. Other forms of PPP can be used, but FELT enables social funding to be channelled directly to the PSO in support of the lease payments.
6.	Conventional hydro in high risk environment (political, security, commercial, regulatory risk etc)	By reallocating most of the risk, other than financing, construction and performance, FELT alters the risk-reward balance to enable projects to be implemented.
7.	Retrofitting hydro to existing dam	Where existing dams are owned by the public sector, FELT enables retrofitting of hydro to be implemented with private finance without the complexities of ownership transfer or rental payments for the existing asset. Where the dam is owned by a bankable private owner, a variant of FELT can be used without need for IFI guarantees. FELT can also be used for pumped storage schemes using existing reservoirs.
8.	Expanding and rebuilding existing hydro	As with retrofitting, expansion of existing schemes by installation of additional capacity, dam raising, enlargement or replacement of waterways and other capital works can be achieved through FELT without complexities of ownership transfer or rental payments.
9.	Hydro at the margins of commercial viability or with a low probability of achieving financial close	FELT, through transfer of much of the commercial risk to the PSO, can enable such schemes to proceed. The PSO can spread the commercial risk among multiple schemes. Also for governments the risk of schemes not proceeding is often much more significant than the risk of poor commercial performance.
10.	Conventional hydro in nation wishing to retain control of resources	Some nations require foreign investment in order to develop projects, but wish to retain ownership and control of their natural resources. FELT provides an ideal concession model for this.

ID	Type of Hydro Project	Reason for using FELT
11.	Hydro in cascade of existing or future schemes	The complexities of varying energy output, time of day of generation, flow disruption, mandatory release of water and attribution of regulation benefits can be avoided under the FELT model if all schemes in the cascade are implemented under FELT. Furthermore the cascade can easily be designed and operated for optimal system benefit.
12.	Hydro to be operated for power system support	The great benefits to power systems achieved from the flexibility of operation can be difficult to access under IPP arrangements, although capacity payment based BOOT models go some way towards this by giving system operators control of despatch. Under FELT the scheme can be operated for maximum system benefit without impact on the Developer's revenue stream.

8 The next steps

Although the FELT model is simple and makes use to a large extent of existing products and contract forms, there are a number of components of the package that need to be refined. Additionally buy-in is required from the IFIs who will assist with funding the up-front costs and provide long-term guarantees of the PSO's payment obligations. The following steps are required:

8.1 IFI buy-in

For most of the situations where FELT will make a difference to poverty alleviation, IFI support will be required for the establishment and operation of a PSO, front-end studies, monitoring of construction and guaranteeing payment obligations.

While this appears a hefty role for the IFIs, it provides a good way of leveraging the limited development funding available. Under traditional public sector implementation for such nations close to 100% of the funding would need to come from multilateral and bilateral funds, under FELT the IFI support is envisaged to amount to 2% to 3% of total project cost for medium sized projects, and around 1% for large projects. It is expected that the payment guarantees would only be called in unusual circumstances, and that funds paid out under the guarantee would be paid back by the PSO once adequate revenue is available.

Hence under the FELT model every $1 billion of IFI funds should mobilise at least $30 billion of commercial funding.

It is expected that IFIs such as World Bank will support the opportunity of leveraging their development funds to accelerate poverty alleviation programmes.

8.2 Guarantees

Existing MIGA style investment guarantees should be adaptable to cover the obligations of the PSO. It is envisaged that the host government would underwrite the obligations of the PSO, and that MIGA style guarantees would provide standard coverage of non-payment, breach of contract, loss of assets through war or terrorism, expropriation and currency inconvertibility and transfer restrictions.

As the guarantees should be in place as part of the FELT package, they would need to be arranged by the PSO rather than the investor, as is currently the norm.

MIGA guarantees are available for investors from 181 member countries to cover investments in 156 developing countries. Hence if MIGA can adapt to the requirements of FELT, there would be few nations excluded, and in those FELT may be used without the guarantees.

Other IFIs may be able to offer similar guarantees.

As the guarantees would be arranged in advance of procurement of the Developer, the cost of the premium would be declared in the tender documents and built into the lease payment.

8.3 Contract Conditions

Since FELT is essentially a financed EPC contract with deferred payment, it is envisaged that the FELT contract will be based on a standard EPC contract form, such a FIDIC Silver Book, with enhanced payment clauses. The standard sections that are normal in hydropower projects covering owner's requirements, warranted information, testing procedures, performance criteria, extended warrantees and delay compensation would be applicable. Enhanced Geological Baseline Report (GBR) clauses are required to ensure appropriate allocation of geological risk, and these are increasingly used in EPC contracts.

In addition to the finance clauses, additional sections are required to cover the concession term and the transfer conditions as well as the PSO's obligations to operate and maintain the facility in good order.

It will facilitate the allocation of responsibilities within the Developer's consortium if the EPC section of the FELT agreement is maintained as a stand-alone document, so that the internal EPC contract can be used back-to-back with the FELT contract.

It is expected that World Bank may be able to provide support for the development of a standard FELT contract that can be deployed with minimal modification.

8.4 Development of a Public Sector Organisation (PSO) Model

While some suitable PSOs may already exist to act as counterparties under the FELT model, it is more likely that new PSOs will need to be formed. These may be subsidiaries of existing government agencies or stand-alone entities directly owned by government.

It will be beneficial if a standard structure and functional description can be developed to enable quick and efficient formulation of the PSO, and to establish consistent models for performance and

operation of these entities. Adjustments will be needed to reflect the particular conditions in each nation, but this can most easily be achieved when based on a standard model and structure.

It is expected that World Bank may be able to assist with development of this model.

9 Summary

In this paper the author has set out the rationale for establishment of a new model for hydropower development. Many of the impediments to development under existing IPP and PPP arrangements have been identified (they do not all exist in any single project); the Finance, Engineer, Lease and Transfer (FELT) concept has been defined; and the means by which FELT addresses the challenges of existing models have been examined.

While FELT is not regarded as the only model for financing private hydro, it may be applied to facilitate development of the most intractable schemes. Variants of FELT, with adjustments to the risk allocation, can also be used where appropriate.

The objective of the FELT model is to mobilise private finance for hydropower projects, and it depends on the availability of IFI funding and guarantees to assist host governments and to guarantee the revenue stream of developers. If used effectively FELT should leverage the impact of IFI funding by a factor of 10 to 20 times, dramatically accelerating the poverty alleviation and development goals of these institutions.

This is an extremely propitious time to be launching FELT. The world is awash with commercial funds seeking moderate returns for a secure investment. Infrastructure such as hydropower can provide such returns, and investment will be released if the balance of risk and reward is acceptable. By disaggregating the return on capital investment from operating and maintenance obligations, FELT provides a secure revenue stream and lower cost of capital for the projects.

In Appendix A questions and answers are presented to address specific issues relating to FELT in greater detail.

Appendix A. Questions and Answers

a. Who operates the scheme?

Since FELT disassociates the provision of the facility from the operation, a range of options are available. The PSO is responsible for the operation and maintenance (O&M), and may undertake this itself or contract it to another party. The O&M could be contracted to the Developer, but if so, this would be under a separate contract.

Since ownership of the facilities will remain with the Developer for the duration of the lease, the PSO will have an obligation to the Developer under the FELT to maintain the plant in good working order such that its value is not eroded.

b. How is transparent competition achieved?

Competitive tendering would be undertaken on a very similar basis to that currently used for EPC contracts. Typically a two stage process would be used, with prequalification based on experience and capability, followed by competitive bidding among 3 to 5 prequalified consortia.

c. What is the basis of tender adjudication?

The primary indicators for adjudication will be price (lease payment) and construction period. Secondary indicators may include currency mix, escalation provisions and other parameters of the lease. However for ease of comparison it is recommended that most lease parameters are defined in the tender documents.

Since the key characteristics of the project will be defined by the PSO, it is not envisaged that technical characteristics will be primary indicators for adjudication. However bonuses and penalties may be applicable for variance from the defined parameters.

In order to encourage design flexibility and efficient construction, the Developer can be permitted to submit alternatives, providing that they do not substantially alter the performance of the scheme.

d. How is concessionary finance for social components handled?

Support in the form of concessionary finance, grants or injection of government funds is provided to the PSO to supplement the commercial revenue. It is important that this revenue stream is defined, and is adequate to maintain the liquidity and creditworthiness of the PSO, otherwise the necessary guarantees will not be forthcoming.

From the Developer's perspective this finance is not differentiated from commercial revenue; it is just part of the lease payment. Providing that the obligations of the PSO are sufficiently

underwritten, social projects with little commercial revenue may be implemented as easily as fully commercial schemes.

e. What is the security for debt finance?

The Primary security for the Developer's debt finance is the cast-iron lease agreement with its guaranteed revenue stream.

Ownership of asset (the facility, but typically not the land) will remain with the Developer for the duration of the lease. This will provide some security for the debt. However hydropower schemes are not transportable, and have little value other than their revenue stream. Hence while ownership of the facility provides some ability to step-in and sell electricity direct, if a market exists, a secure and guaranteed revenue stream provides the best debt security.

f. Why is it easier to make lease payments bankable than energy and capacity payments?

The objective of the FELT model is to secure a consistent and reliable revenue stream that will service the project debt and provide a reliable return on equity investment. The FELT model therefore aims to strip out any aspect that could result in variation of the revenue stream and hence diminish its bankability.

Energy (MWh) output from hydropower schemes is likely to change with the variation of river flow. Initial estimates may be incorrect, daily seasonal and cyclical variations occur in weather patterns, and climate change introduces other variables. Capacity (MW) tends to be more consistent, and capacity-based concessions can be configured to approximate to a fixed monthly payment. However most capacity-based agreements allow for variation in the payment based on availability, and some PPAs base the payment on actual capacity deliverable rather than installed capacity. Any such variation mechanism reduces the predictability of the revenue stream, resulting in higher risk rating for the business.

Energy and Capacity Payments tend to be formulated as Power Purchase Agreements with electricity utilities as the counter-party. As a result of their exposure to retail electricity trading, often with regulated retail prices, utilities may have poor credit ratings, and it is harder to provide guarantees than for a single-purpose entity envisaged under FELT.

g. How will the PSO get its income?

It is important that the PSO has a reliable income stream sufficient to cover its operating costs and the lease payments. Without this it will always be at risk of default on the lease payments, a situation that will not be acceptable to the agencies underwriting the PSO's obligations. The business plan of the PSO must be fundamentally viable.

The revenue streams will depend on the sophistication of the energy market, the social component of the project and whether multipurpose components can be monetised. Sale of energy (or

arbitrage in the case of pumped storage) is likely to be a core component of the revenue stream. Other grid benefits are likely to be handled under a capacity payment structure, although in sophisticated markets some of the ancillary benefits may be remunerated separately.

For social components and multipurpose benefits that cannot be monetised, a revenue stream from government will be needed, possibly supported by donors. This revenue stream will need to be defined and committed in advance in order to validate the PSO's business plan.

If the PSO is the Grid Operator, or is acting on behalf of the Grid Operator, the grid support component may be levied on customers (generators and consumers) in the same way as other grid infrastructure costs.

h. How long should the lease be?

There is no definitive lease term under FELT. However the term needs to be long enough to provide an attractive investment vehicle while providing tangibility to the nation of the transfer date. The aim must be to transfer the scheme while there is significant residual life. Since the life of a hydro scheme may exceed 100 years, this should easily be achievable.

It is suggested that the term should be between 20 and 40 years – perhaps 30 years.

i. Will FELT projects cost more than BOOT?

FELT leases should result in significantly lower cost of electricity than the equivalent BOOT project. The basic EPC cost will not differ greatly from its BOOT equivalent, although with the transfer of ground condition risk from the Developer to the PSO, the EPC cost should be lower once provision for such risks is stripped out. The transfer of the development costs and most of the revenue risks to the PSO should result is significantly lower cost of finance (both equity and debt) resulting in lower cost of electricity.

j. Does the lease payment need to be index linked?

It should not be necessary to index link the lease payments since the Developer has minimal outgoings following the completion of construction. Without rising costs to cover, there is no need for his revenue to rise, providing that the lease is denominated predominantly in the currency of the financing.

Once the construction risk period is passed, the lease will provide a secure fixed term income stream and the financial markets can value the "yield to maturity" in the same way as a bond.

k. What does a FELT contract look like?

The FELT contract will closely resemble a standard EPC contract, such as FIDIC Silver Book, including a performance specification. However lease terms will be substituted for conventional milestone payments.

Modification of the bonding and liquidated damages clauses will be required; a performance bond is envisaged to ensure that the appointed Developer delivers the project, and liquidated damages would ensure performance parameters are met. Step-in rights for the PSO would be required in the event of protracted delays.

l. What level of project definition is provided by the PSO?

The level of project definition would essentially be the same as for an EPC Contract. The key design parameters such as flood flows, seismic design parameters, reservoir levels and full performance specification, would be provided.

In order to provide an agreed basis for the lease price, a geological baseline would be provided.

Where possible flexibility would be allowed to the Developer to offer alternative solutions, providing that the performance, durability and risk profile of the project are not compromised. This will allow for innovation and efficiency in construction while delivering an essentially identical product.

m. Will projects be better prepared?

One of the difficulties for IPP developers under the BOT/BOOT mechanism is in financing projects before financial close. All of the funding for this stage comes from equity, and in view of the high risks at this stage, the cost of finance is very high. There is a tendency to minimise expenditure at this stage, even though it is recognised that funds spent on project preparation will reduce risk, uncertainty and potential costs overruns and delays during construction.

By ensuring adequate funding for project preparation, FELT will allow reliable technical, environmental, social and economic studies to be performed. It will also permit climate resilience studies and sustainability analysis to be undertaken, which under current mechanisms may be unaffordable.

n. What organisations will participate?

It is envisaged that consortia bidding for FELT contracts would comprise contractors, equipment suppliers, consulting engineers and financial institutions. Other parties may be involved to provide coordination and development skills, although with the transfer of most of the development responsibility to the PSO there is less need for such expertise.

o. Who carries exchange rate risks?

It is envisaged that most, if not all, of the exchange rate risk will be carried by the PSO, possibly underwritten or with support from IFIs or donors. Since the FELT model is primarily designed to attract foreign investment into developing economies, and to minimise the cost of such investment, it is appropriate to offer a firm forex denominated return. However a split forex / local currency lease could also be considered.

p. Who owns the land?

It is envisaged that the land on which the facilities are constructed, areas for temporary works, quarries and rights-of-way would be procured by the PSO and provided free-of-charge to the Developer. In this way there would not be a need to transfer land ownership to a foreign entity, a process that can be problematic under some legislation.

q. Who owns the facilities?

Ownership of the facilities would remain with the Developer from the commencement of construction until the date of transfer at the end of the lease term, subject to step-in rights during the construction period.

r. When does payment start?

Payment would commence on the date of beneficial occupation of the facility by the PSO, which would typically correspond with substantial completion. For complex projects where phased commissioning is possible, phased handover with correspondingly phased commencement of the lease payments would be possible.

The PSO would not be able to delay taking possession in order to delay the start of payments.

s. Who is responsible for cost overruns?

With the exception of variation from the geological baseline and changes or cost increases due to the PSO or resulting from variations in parameters under the responsibility of the PSO, cost increases would be borne by the Developer.

Force Majeure clauses typical of EPC contracts would provide relief to both parties.

t. Are additional costs for unexpected conditions reimbursed?

The lease price will be based on the geological baseline report (GBR) provided by the PSO. Variation from this GBR, upwards or downwards, will result in adjustment of the lease payment according to a pre-agreed formula. The variation in price will take account of variation in the construction period which typically results from departure from the GBR conditions.

u. Who is responsible for delays?

Since payment does not start until the PSO is able to take beneficial ownership, responsibility for delays during construction are the responsibility of the Developer. However where the delays result from unexpected ground conditions or from the actions or activities under the responsibility of the PSO, adjustment to the lease payment will be due, based on pre-agreed formulae.

Force Majeure clauses typical of EPC contracts would provide relief to both parties.

v. Who takes hydrological risk?

The hydrological risk for energy generation is carried by the PSO along with other market risks.

Similarly the hydrological risk in connection with the reservoir operation and spillway flows is carried by the PSO, which was responsible for the hydrological studies during the feasibility study stage.

w. How does FELT differ from BOOT with capacity payment?

Under the BOOT arrangement the Developer is responsible for operation of the scheme, and hence any failure in performance of the operation and maintenance obligations may imperil the revenue stream. Under BOOT the two functions of constructing the facilities and operating the facilities are combined, and a single revenue stream covers both. Hence the funder of the facilities is exposed to the risk of non-performance of the operators.

Under FELT the revenue stream for provision of the facilities is not subject to the performance of the operator, and hence the funder of the facilities is only exposed to risks related to construction and provision of the facilities.

x. How does FELT differ from EPC+F?

Under Engineer, Procure, Construct and Finance (EPC+F), the contractor brings a funding package for the project – in many ways similar to FELT. However under EPC+F the ownership of the asset rests with the Government, and funding is provided to the Government. Under FELT the ownership of the asset is retained by the Developer, which is also the recipient of the funding. EPC+F has had limited success in mobilising private sector funding.

y. Can FELT be used in advanced deregulated markets?

In most deregulated markets the roles of the generator and system operator have been separated, and it is unlikely, although not impossible, that FELT would be used for a conventional energy generation project. However with the growing requirement for grid support to enable the integration of intermittent renewable technologies, with decommissioning of thermal generation, and with market uncertainty impeding development of projects needed to provide stability and security to the grid, FELT would be an ideal model for procurement of grid support projects by the system operator.

In advanced economies the guarantees that are necessary in emerging economies would not be needed, and some of the risk allocation concepts could be modified. However FELT would work well for the grid operator to specify and procure peaking generation, pumped storage hydro or other grid support technologies.

z. Is FELT only suitable for Hydropower?

The concept behind the FELT model is widely used in other industries, ranging from office blocks to commercial aircraft. Hence it may also be used for a wide range of generation and other power infrastructure (transmission lines, substations etc). However it is primarily of benefit for projects with large capital cost and complex and uncertain revenue stream, or where projects are justified on the basis of national economics, but do not have an adequate revenue stream.

For example the author has in the past proposed a similar concept for development of transnational interconnectors in Africa, where there is strong economic justification based on mutual grid support, but where energy transfer volumes are variable, making flow based tariffs non-viable.

aa. Can PSO support funds be recycled?

It is possible to add the cost of the project preparation studies and other development costs into the capital cost of the project. This increases the amount to be financed by the Developer, and consequently the value of the lease payments required. On contract award/financial close this sum would be reimbursed to the IFIs that had funded project preparation, enabling the funds to be used for preparation of other projects.

This concept would work well with the Hydropower Support Facility, which is being promoted by the International Hydropower Association (IHA). Under IHA's concept a revolving fund of $1 billion would be established by IFIs and governments to fund preparation of hydro projects, with the project preparation cost reimbursed and recycled at financial close.

bb. How would Green Bonds fit with FELT?

There are a number of possible routes for deployment of Green Finance under FELT. For projects which assessed to comply with Green Finance criteria (for example by achieving satisfactory performance under the Hydropower Sustainability Assessment Protocol) part of the required project finance may be pre-arranged with PSO, and offered to the Developer under the tender process. Alternatively, funds may be offered direct to the Developer as a component of his financing.

PSOs should be able to operate as commercial and profitable corporations, with operating revenue exceeding their outgoings spread over a portfolio of projects. Providing the PSO complies with sustainability criteria, it may provide an investment opportunity for Green Finance.

cc. How will the lease be treated in National Accounts?

The treatment of a FELT lease in the National Accounts will vary by nation. However, under the international accounting standard IFRS 16, The “right to use” is treated as an asset, balancing the “obligation to pay” the lease. The right-of-use asset is treated similarly to other non-financial assets and depreciated accordingly, considering the transfer value at the end of the FELT term.

IFRS 16 is typically replacing older accounting standards which allowed operating leases, such as PFI and BOOT, to be taken off the government balance sheets.

Appendix B. Acronyms and Abbreviations

BOQ	Bill of Quantities
BOT	Build, Operate and Transfer
BOOT	Build, Own, Operate and Transfer
EPC	Engineering, Procurement and Construction (i.e. turnkey) form of contract
EPC+F	EPC with Financing added
Eskom	The national electricity utility in South Africa
FELT	Finance, Engineer, Lease and Transfer (concession model)
FIDIC	International Federation of Consulting Engineers (have a suite of standard contracts)
FIT	Feed-in Tariff
GBR	Geological Baseline Report (agreed geology on which the tender price is based)
GET FiT	Global Energy Transfer Feed-in Tariff program – Uganda's enhanced FIT model
GHG	Greenhouse Gas
IDC	Interest during construction
IFC	International Finance Corporation (World Bank Group)
IFI	International Financial Institution
IHA	International Hydropower Association
IPP	Independent Power Producer
kWh	Kilowatt-hour
MIGA	Multilateral Investment Guarantee Agency of World Bank
MW	Megawatts (of power)
MWh	Megawatt-hours (of Energy)
NHPC	National Hydroelectric Power Corporation Ltd of India
O&M	Operation and Maintenance
PPA	Power Purchase Agreement
PPP	Public-Private Partnership
PSO	Public Sector Organisation – the Lessee under FELT
Q&A	Questions and Answers
REFIT	Renewable Energy Feed-in Tariff
Shovel-ready	Status where studies are complete and land, licences and approvals obtained
USD or $	United States Dollar (all values are in USD)
WAPDA	Water and Power Development Authority of Pakistan