RIVER HEALTH, ENVIRONMENTAL FLOWS AND CASCADE MANAGEMENT IN LAO PDR

December 7, 2012, Mercure Hotel, Vientiane, Lao PDR

Introduction

The IFC recently approved a five year Advisory Services Program to help improve the environmental and social standards of the hydropower sector in Lao PDR. The IFC is partnering with the Environmental Management and Support Program funded by the Government of Finland. The EMSP is working with the Ministry of Natural Resources and Environment on issues related to hydropower development, including environmental flows and water quality monitoring. The IFC is working with the Government of Lao PDR, regional financial institutions, and hydropower companies to enable capacity in practical environmental and social risk management for government agencies, river basin committees, and other basin stakeholders to anticipate, evaluate, and manage cumulative impacts of hydropower investments in selected river basins.

On September 21, 2012, a cumulative impact assessment and management workshop was held in Vientiane, co-hosted by IFC and the Department of Water Resources and the Department of Environmental and Social Impact Assessment of MONRE. Key issues identified by participants included the importance of addressing water quantity in cascade management and improved assessment and management of environmental flows (E-flows).

The River Health, Environmental Flows and Cascade Management in Lao PDR workshop was organized as a follow-up activity to further raise awareness and understanding of E-flows and to explain its relevance to hydropower development in Lao PDR. The workshop was held on December 7, 2012, and was co-hosted by the IFC, EMSP, MONRE (DWR and the DESIA), as well as the Nam Ngum River Basin Committee Secretariat.

Participants and Agenda

The workshop was attended by officials responsible for water resource management from the national and provincial levels in Lao PDR, including counterparts from the provinces of Luang Prabang, Xieng Khuang, and Vientiane. Representatives of the EMSP and the Nam Ngum River Committee Secretariat were also in attendance. A list of the participants and agenda are attached as Appendices 1 and 2, respectively. The workshop presentations are attached as Appendix 3.
Key Workshop Messages

1) Basic principles and benefits of using the E-flows approach

- Although the concept of environmental flows has been in existence for a considerable time, the understanding and adoption of E-flows as critical public policy by water managers is only very recent
- It requires establishing water flow regimes which recognize ecosystem needs to maintain the health of the river, while satisfying social and economic demands such as livelihoods
- It can be an important tool to assist diverse stakeholders in the process of negotiation and better understanding of water resources
- Negotiating E-flows is an essential part of river basin management
- The best E-flows solution for environmental health of the river is when the flow releases mimic natural flow conditions
- E-flows are not just about water but also need to include physical, biological and socioeconomic considerations
- There is definitely an economic cost for not addressing E-flows

2) Tools and techniques to address E-flow requirements

- Accurate data collection and analysis and effective data management and dissemination
- Hydrological modeling combined with assessment of biological and livelihood considerations. Many software packages are available; training is required for Government of Lao PDR staff in their use and application
- Active stakeholder participation is critical, particularly at the local level
- Close collaboration between government and authorities needs to be established at local, provincial, and national levels

3) Linkages between Cumulative Impact Assessments and E-flows

- E-flow is the balance between water resource use for development and for environmental protection. CIA is used to assess impacts to the environment from multiple sources or developments. Environmental Impact Assessments are for specific projects only; CIA is for a combination of projects
- Collection of accurate baseline data, and training and capacity building, are key requirements for further work on CIA and E-flows in Lao PDR

4) Challenges for implementation

- There is a need for strong political will and stakeholder support and sufficient resources and capacity in water management, as well as a need to remove institutional barriers and openly discuss potential water resource use conflicts
- Conflicts arise when people have different opinions on water uses and benefits
- Putting E-flows theory into practice requires knowledge of a range of different disciplines (hydrological modeling, fisheries, socioeconomics, engineering, and so on)
- There is no `one-size-fits-all` approach
5) Case studies

- Experiences in other parts of the Mekong and around the world have demonstrated the importance of case studies and capacity building for raising awareness of E-flows
- The Nam Ngum River Basin was identified as a good potential case study location for Lao PDR
- Collaboration with hydropower developers is crucial
- As much as possible, work should be conducted at the local level and capacity building and training focused on provincial authorities
- Case studies need to address physical, biological, and social elements of E-flows and contribute to improved water management practices for different water users

Following is a brief summary of the presentations made at the workshop, a summary of the plenary discussions, and recommendations for follow-up activities.

Session One
Chair: Mr. Chanthanet Boualapha, Director General of DWR

Opening Remarks

Boualapha welcomed the participants and expressed thanks for support from IFC and EMSP for hosting the workshop. He explained the objectives of the workshop and stated that improved understanding of E-flows is essential to provide environmental, social, and economic benefits to Lao PDR. Boualapha also stated the importance of an inclusive approach with multi-agency and stakeholder involvement.

Workshop Introduction and Objectives
Thomas Boivin, Managing Director of Hatfield Consultants Mekong

Boivin provided background information on the workshop and outlined the overall objectives and expected outcomes.

Objectives

The main objective of the workshop was to raise awareness of the E-flows concept, including:

- background information on legislation and policies; and
- tools and techniques which are currently being applied in the Mekong region and elsewhere to address E-flow requirements.

Emphasis will be placed on E-flow considerations related to hydropower development in Lao PDR and their importance in Cumulative Impact Assessments of hydropower cascades. The responsibilities of different stakeholders related to E-flows was also discussed (for example, developers, the government of Lao PDR, Electricite du Laos, and others), as well as the need for development of guidelines and standards (such as Environment, and Social Obligations) appropriate for Lao PDR.
**Expected Outcomes of the Workshop**

1. Improved understanding of the E-flows concept and its application for hydropower development in Lao PDR
2. A concrete list of follow-up activities, including:
   - training and capacity building
   - identification of E-flows methods, tools, and applications which are appropriate to the Lao PDR context; and
   - planning for pilot programs and field activities in selected river basins (Nam Ngum, Nam Ou and others). Pilot activities will be organized with representatives from DWR, DESIA, and other government departments, the Nam Ngum River Basin Committee Secretariat, EMSP and university representatives.

Boivin also presented a brief overview of the benefits of healthy river systems and the impacts of hydropower projects on river health and the environment, as well as a background on E-flows.

**Presentation One: Introduction to Environmental Flows**
**Christopher Gippel, Griffith University, University of Melbourne, and Fluvial Systems Pty Ltd**

Gippel explained the links between river health and river flow as well as the definition and concept of environmental flows. Fish and other aquatic organisms are adapted to specific habitats so a diversity of habitats is needed for healthy river ecosystems. There are multiple and often conflicting uses of a river system which need to be considered by water resource managers. Many species are adapted to seasonal variability, and this normal variation in flows is essential to maintain the ecological health of rivers. Most water users require a steady flow, including hydropower developers and other industries as well as irrigation. Given the importance of reaching consensus among various stakeholders involved in water resource management issues, E-flows may be regarded as a social issue which is addressed through scientific study and analysis. Gippel presented a brief overview of the scientific methods used to determine E-flows in different parts of the world and described the six main steps used to assess environmental flow needs.

Gippel explained the approach used in his previous research on spawning requirements related to flows for many species of fish and aquatic biota. He also presented results from a case study in China where hydraulic modeling was used to assess environmental flow issues and provide recommended flow regimes for a river affected by hydropower development. The environmental flows assessment used for the case study was a holistic site-based and ecological assets-based approach. The methodology combined information on ecological and other key assets associated with the river system such as fish, vegetation, water quality, and geomorphology. This information is used to link ecological assets to the flow regime via hydraulic relationships. This approach proved advantageous when compared with a ‘hydrology-only methodology’ due to the latter’s failure to take into account the downstream change in the relationship between a river’s geomorphic and hydrologic characteristics.
Presentation Two: Negotiating Flows in the Mekong
Kate Lazarus, Lao Hydro Team Leader, IFC

Lazarus presented examples of pilot studies led by the International Union for the Conservation of Nature that were undertaken in the Huong River Basin in Vietnam and the Songkhram River Basin in Thailand. In these pilot studies E-flows were used in deliberative processes to negotiate acceptable flows between competing uses. Both governments have had successes and challenges applying E-flow principles and are making progress to this end; the Vietnamese government has updated the Law on Water Resources & National Water Resources Strategy based on the results from the Huong River Basin case study.

Lazarus emphasized that negotiating water flows is an essential part of river basin management in the Mekong region and that E-flows can be an important tool to assist diverse stakeholders in the process of negotiation and better understanding of the resource. Applying the E-flows approach requires establishing water flow regimes which recognize ecosystem needs while satisfying social and economic demands. She acknowledged that the E-flows concept is not easy to apply, and translating it into Lao language is challenging; therefore we had invited a number of experts to present their views at this workshop. Lazarus also emphasized that putting E-flows theory into practice requires the work of a range of different disciplines, including engineering, law, ecology, economy, hydrology, sociology, political science, and communications, and that there is a need for pilot programs/case studies to assess potential applications of E-flows approaches. We can learn from the various approaches that have been used in other countries, and there is ‘one-size-fits-all’ approach.

Presentation Three: E-flows in the Mekong River
Mr. Oulaphone Ongkeo, Mekong River Commission Secretariat

Ongkeo described the basic principles of the 1995 Mekong Agreement in which the four riparian countries had agreed to cooperate on maintaining flows on the mainstream. He also explained the Mekong River Commission’s hydrological monitoring network along the Mekong River and the implementation of MRC procedures related to Integrated Water Resource Management in the Mekong Basin. The key issues and limiting factors in determining E-flows for the Mekong River include:

a) there are few monitoring stations on the Mekong in Lao PDR, particularly on tributaries;
b) it is challenging to meet our obligations to share information with neighboring countries if we don’t have basic hydro-meteorological data; and
c) there is a strong need for improved baseline data for hydropower development – developers have to spend a lot of money on data collection as there is no national data system in place.

There were numerous questions and comments following the presentation as well as discussion on the issue of potential impacts of hydropower development on flows in Lao PDR. MONRE stressed the need for establishing a monitoring and management system that involves all sectors and departments. The importance of developing a hydro-meteorological monitoring system for the 17 most important tributaries in Lao PDR was also stressed, as well as the need to collect more data for hydrological modeling.
Stockwell explained that, although the concept of environmental flows has been in existence for a considerable time, the understanding and adoption of E-flows as critical public policy is more recent. In a number of countries significant progress has been made in developing policies, laws, regulations, and procedures, but there has been little action on implementation beyond policy formulation because of a number of obstacles such as: lack of political will and stakeholder support; insufficient resources and capacity in water management; and institutional barriers and conflicts of interest.

Stockwell presented a brief overview of experiences in implementing E-flows policies and practices in three countries: South Africa, Brazil, and the province of British Columbia in Canada. In the British Columbia case study, extensive stakeholder consultation, water use plans, and operating rules have been developed to address issues related to declining fish stocks and aquatic habitats. However, these negotiations have taken many years to complete. In South Africa the National Water Act of 1998 introduced an E-flows component to balance basic human needs and ecological reserves ahead of economic uses of water, using catchment management strategies. However, implementation challenges include conflicting water use and management plans produced by local jurisdictions, insufficient institutional capacity, and a lack of political will. In Brazil hydropower development is the primary driver of E-flows. Recent progress was made on water policy development when the government launched the National Water Resources Plan in 2006, which adopted an ecosystem-based approach to water management. A legal framework is currently being developed to move from minimum flows to recognition of the need for environmental flows.

Stockwell recommended the following: objectives and goals should be clearly defined; policies and programs should be developed that recognize institutional constraints and allow for ongoing capacity development; successful implementation involves good science and broad stakeholder involvement; and sustainable funding mechanisms are critical as this is a long-term process.

Gippel's second presentation provided practical examples of E-flow applications. He recommended using a holistic assessment method for E-flows assessment in rivers where there are many conflicting users. The holistic approach attempts to consider the entire ecosystem and includes the process of balancing environmental flows with the water needs of other users. The environmental flows assessment approach aims to maintain the specific assets identified by users as important for each river or river reach being assessed. The assessment of E-flow requirements, as well as their implementation, may benefit from engaging with a range of stakeholder categories; therefore a team needs to be assembled representing the different views of the use of the river (ecological, social, and so forth). There will be different stakeholders that may be able to contribute to the assessment of E-flow requirements, determining community goals and values, and identifying key ecological assets associated with specific regions.

Gippel then presented a brief overview of the environmental methodology he applied for a pilot study on a river in China, using the Flow Health Hydrology Assessment tool. The FHHA tool is an application to assist in the assessment, design and management of river flow regimes. It focuses on hydrological aspects of river health assessments, but it can also be used as a tool to assist with environmental flow assessment. The FHHA tool was demonstrated and may be downloaded for free from the following web
Session Two
Chair: Mr. Chanthanet Boualapha, Director General of DWR

Presentation Six: Linking Cumulative Impact Assessments and E-flows
Dr. Lilao Bouapao, Lao National Consultant for IFC

Bouapao explained the concept of cumulative impact assessments and stated that E-flows may be considered as one of the elements of CIA. Cumulative impacts are the incremental impacts of a development when added to other past, present, and reasonably foreseeable future actions. Small actions by themselves may seem insignificant, but when considered together they can have a large impact (‘death by a thousand cuts’). Bouapao also demonstrated how E-flows fit within the context of the CIA `Six Step` process.

Conflicts arise because people have different views on how water resources should be used. People also have very different interpretations of the E-flows concept: some believe E-flows refer to the amount of water available for industrial use and consider them as ‘engineering flows’ or ‘economic flows’ (not ‘environmental flows’). There is also a need to consider the basic needs of humans regarding water resources; different people have different interests, and that is the source of conflicts.

One participant commented that different users have different views on how water resources are used, and divergent views can create conflicts. The different perspective of E-flows and water resources is not only an environmental issue but is also related to culture, beliefs, and livelihoods.

Presentation Seven: What Do Environmental Flows Mean for a Cascade of Dams in a River Basin?
Peter-John Meynell, Consultant

Meynell explained the principle of E-flows and how to apply them for hydropower developments in the Mekong region. He emphasized that the best E-flows solution for environmental health of the river is when the flow releases mimic natural flows; also that there is definitely an economic cost for not addressing E-flows. Modeling studies using hydrological reservoir models as a tool to determine environmental flows and undertaken on a cascade of dams in in the Sesan River Basin in Vietnam and Cambodia were demonstrated. Meynell explained that E-flows are not just about water but also about fisheries, sediment transport, livelihoods and other issues. He used the Nam Ou as an example, which is the next biggest producer of sediment in the lower Mekong after the 3S rivers (Sesan, Srepok and Sekong). The cascade of seven dams on the Nam Ou is estimated to trap over 70 percent of the sediment now discharged from the Nam Ou. He also emphasized the need for simulated floods as a mechanism to maintain river channels.

Group Discussion

A number of questions were posed to the participants, who debated and discussed a variety of issues related to E-flows. Comments from participants are summarized below.

Question: What is the link between CIA and E-flows – similarities and differences?
E-flows are the balance between water resource use for development and for environmental protection. CIA is a process for assessing continuous impacts to the environment. Environmental Impact Assessments are conducted for specific projects only; CIA is conducted for a combination of projects. We need to have baseline data for both CIA and E-flows; if we have enough data for CIA, we will have enough information for determining E-flows.

**Question – How to balance E-flows with water resource development?**

We need baseline data and a good understanding of: how much water we need (water use); how much water can be discharged in dry season/wet season; and water needs for ecological and social protection. Water use needs to be determined for fisheries, irrigation, agriculture, human consumption, industry, flood protection, and more. Water quality needs to be maintained and protected. Water allocation between upstream and downstream is important, with clear linkages and proper planning needed for hydropower and other developments. There is a need for modern water monitoring systems at several sites so that we obtain accurate and consistent data.

**Question - How can we ensure we satisfy all sectors and stakeholders in water allocation?**

Integrated Water Resource Management should be used to balance water allocation among the many users and to ensure consideration of E-flows in decision-making processes. There is a need to look at different aspects of river basins; a need both to maximize use and to make the best use of the basin for the environment. E-flow requirements will be different for different river systems. There is significant competition for water resources in Lao PDR. There is a need to determine what allocations are required for different purposes; different quality of water is required for industry compared to domestic households, fisheries, and other uses.

E-flows help to maintain ecological systems. Improved data management is needed; if we have good data we can better manage our resources over the long term. We need to share data and information on an equal and fair basis between different sectors (agriculture, public works, and hydropower). Communities also need to be involved in E-flow activities and decision making. Many agencies need to be involved in information dissemination at national, provincial, district and village levels.

When people conduct E-flows assessment they often get caught up in details of which methods or approaches to use. This type of problem can delay implementation of E-flow considerations. When E-flows are determined and established they are often modified soon after to reflect the real situation; E-flows need to be adjusted once a dam is in operation and need to be flexible. The best approach is to just get started on the process of establishing E-flows as this offers some level of protection to the river. The actual E-flow requirements can be revised later and adjusted in future as more information becomes available and as the water managers gain more experience with the process. The most important thing is to get started!

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**Session Three: Practical Application/Training in the Nam Ngum River Basin**

**Chair: Mr. Phonechaleun Nonthaxay, Director General, Nam Ngum River Basin Committee Secretariat**

The plenary discussion on the Nam Ngum River Basin Pilot Study resulted in a number of important conclusions and recommendations, as follows:
1. **Which agencies should be involved in the pilot study?**

We should include a wide range of stakeholders from national and provincial levels involved in IWRM. River Basin Committees need to play a key role, and work should be focused at the local level to the extent possible. Collaboration with a hydropower developer was regarded as important to the success of pilot programs.

2. **Where will we start the pilot – at basin level or in certain areas? When will we start?**

It is important to start as soon as possible with a small pilot study in a location where we know it will work and where problems can be relatively easily solved.

A variety of stakeholders need to be involved, so we should choose a place where stakeholders are positive about making progress and want the process to be successful. Achieving consensus from a number of stakeholders is critical.

If possible it would be ideal to get experience from conducting many pilot studies in different locations. Perhaps we should consider one pilot at the river basin level and a second pilot at the sub-basin level.

It was suggested to use the experience of existing River Basin Committees and river basins where data are being collected and plans are being developed, such as the Nan Ngum and Nam Theun-Nam Khading River Basin Committees. Close collaboration between central and local levels is critical; however, there needs to be a clear distinction between the different government levels as the work needs to be performed primarily at the local level.

Several hydropower projects were identified as options; for example, Nam Ngum Three, since there may be little allocation for E-flows up to 20 kilometers downstream of the dam. Since the Water Law is currently under revision the pilot would provide on-the-ground experience, and the pilot results may feed directly into the Water Law and follow-up decrees. Training and capacity building of people in the river basin, and technical guidelines to be developed regarding E-flows, will help support water resource managers at the national level as well.

There was general support for Nam Ngum Three as a potential pilot site. Nam Pa hydropower dam (downstream of Nam Ngum Three) may be suitable, but other potential sites need to be discussed and considered before a final selection is made.

E-flow concepts are still applied only at the theoretical level in Lao PDR. Some developers are using E-flow principles in their management plans, but they are not yet applied at the community level. There is a need to follow the laws and regulations of Lao PDR. Assessments should be conducted to determine water allocation needs. We need to build on lessons learned from other studies on the Nam Ngum River Basin.

3. **When can we start and what do we need to do to get going?**

The first step is to establish a working group to coordinate and implement the activities.

We need to encourage the working group to start right away and show some small successes as soon as possible. We want to start in the next few months, not wait six months to get started. We need to come up with a good study design and decide on the requirements for the pilot studies for consultation, training and capacity building, field surveys (hydrology, fish), and so on.
4. Who should take the lead?

It was suggested that DWR should take the lead role. For proposed activities in the Nam Ngum River Basin, the River Basin Committee Secretariat should also play a key role, as well as other government agencies at national, provincial and district levels (mining, electricity, public works, and others), developers, and civil society organizations.

The lead agency's role is one of key mediator and facilitator; however, all members have a voice. The scientific work should proceed independently, and the lead agency would be responsible for passing on the relevant information to the technical committee. Work on CIA and E-flows will also require water management decisions to be made among the different agencies. Although the focus is on the Nam Ngum River Basin, linkages with E-flows issues in the Mekong Basin as a whole need to be emphasized. Capacity building and awareness raising for provincial government staff is crucial.

5. What type of training is needed?

There is a need for more training and capacity building on E-flows. A longer-term course on E-flows should be designed to provide in-depth information to assist with practical implementation. Departments concerned should also develop and disseminate guidelines and standards to improve people's understanding of E-flows.

There is a need to cooperate with project developers as well as government stakeholders. There is also a need to develop and disseminate E-flow standards and guidelines to key stakeholders. If standards are developed in English they can be very difficult to understand when translated into Lao language. There is a need for training and capacity building to understand the terminology and approaches.

There are a number of training opportunities to be provided by IFC under this program. It is important for MONRE to determine the types of training which are required and most desirable to the government. On-the-job training through conducting the pilot study will be important. A longer-term course on environmental flows is also needed so water managers can better understand the requirements for conducting E-flow assessments. Working with developers is crucial – a project which is not yet operational is ideal – however, a project which is currently operating is also interesting because we can look at lessons learned and learn more about mitigation measures. We may wish to consider the following in the pilot studies: new developments and operating hydropower projects.

Closing Remarks: Phonchaleun Nonthaxay

We learned a great deal at this workshop, and I am pleased to see that a number of follow-on activities are planned in future. It is recommended that we keep the same group as is present here today for future meetings and training so that we can come up with practical solutions to real problems. It is important that we demonstrate that E-flows have real benefits – not just on paper, but practical results.

Next steps and recommendations for the successful implementation of E-flow pilot studies

1) A working group should be established to determine the location and requirements for case studies, including capacity building and training needs.

2) The objectives and goals of the E-flows case study and the methodology and approach must be clearly defined.
3) Policies and programs should be developed that recognize institutional constraints and allow for ongoing capacity development.
4) It is important to integrate good science and broad stakeholder involvement.
5) Identifying sustainable funding mechanisms is important because this is a long-term process.
6) When conducting an E-flows assessment we should not get bogged down in the details; the best approach is to just get started with the process and be flexible in its implementation.

Schedule for Follow-Up Activities

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<th>Activity</th>
<th>Responsible Party</th>
<th>Date</th>
<th>Comments</th>
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<tr>
<td>1. Prepare workshop report and send to organizers for review</td>
<td>Hatfield Consultants</td>
<td>Early February 2013</td>
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<td>2. Meet with key stakeholders in the government, and develop a work plan and schedule for follow-up activities</td>
<td>Hatfield &amp; IFC</td>
<td>Early February 2013</td>
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<td>3. Group meeting among key stakeholders to determine the pilot project location</td>
<td>Government stakeholders</td>
<td>February 11 2013</td>
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<td>4. Prepare a brief report outlining meeting outcomes, including specific options &amp; action plans</td>
<td>Hatfield</td>
<td>Third week of February 2013</td>
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<td>5. Establish a working group for pilot implementation, which will include representatives from DWR, DESIA, and other government departments, the Nam Ngum River Basin Committee Secretariat, EMSP, university representatives, and hydropower developers</td>
<td>Hatfield with stakeholders</td>
<td>End of February 2013</td>
<td>We need to determine who will be the leading agency</td>
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<td>6. Convene working group session to design and plan one or two pilot programs and field activities</td>
<td>Working group</td>
<td>Early March 2013</td>
<td>The pilot will be implemented throughout the year</td>
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<td>7. Pilot activity implementation plan, including capacity building needed</td>
<td>Working group</td>
<td>Early March 2013</td>
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<td>8. Training conducted related to pilot activities. Include dry season (tentatively March-April) and wet season (tentatively August) sampling</td>
<td>Chris Gippel, Lilao Bouapao &amp; Hatfield</td>
<td>End of March-April and August 2013</td>
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<td>9. Establish guidelines for E-flows</td>
<td>Working group</td>
<td>June-September 2013</td>
<td>The working group should take the lead with support from IFC, Gippel, EMSP &amp; Hatfield</td>
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