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## **► Editorial du Président**



Chers amis,

*C'est un honneur mais aussi un plaisir pour moi d'avoir été élu Président de la Section Française de l'American Nuclear Society lors de notre dernière assemblée générale annuelle du 12 octobre 2007.*

*Je remercie ici ceux qui m'ont accordé leur confiance pour assumer cette tâche à laquelle je m'efforcerai d'apporter toute ma conviction afin de maintenir et si possible renforcer nos relations avec les U.S.A. dans le domaine nucléaire.*

*Au nom de tous les membres du bureau, je tiens à remercier tout particulièrement mon prédécesseur et ami Franck Carré pour son action particulièrement efficace mais aussi pour son dévouement au service de notre association. J'espère qu'il pourra continuer à nous conseiller utilement pour réaliser au mieux nos différentes initiatives.*

Dans cet éditorial, je dois malheureusement introduire une note de tristesse avec la disparition de notre collègue, Jean Loup Rouyer qui pour beaucoup était aussi un ami. Comment ne pas regretter profondément la disparition d'un homme d'une telle qualité, tant sur le plan professionnel que sur le plan humain. Un bref hommage lui est rendu dans ce numéro mais je tenais à évoquer ici personnellement sa mémoire et pour lui apporter un témoignage posthume, j'ai choisi de vous livrer ici une courte anecdote.

C'est au cours d'une partie de tennis jouée avec lui, à l'occasion d'un Congrès ANS à Washington. Quelqu'un s'est approché et une conversation s'est engagée avec Jean Loup. J'ai alors vite compris que notre visiteur était un grand connaisseur, et j'ai appris qu'il était en fait, comme Jean Loup, un ancien professionnel de tennis. Ainsi, il avait remarqué la qualité du jeu de notre ex n°3 français mais il avait aussi détecté semble-t-il un point faible de son jeu, que Jean Loup n'a jamais voulu me dévoiler en me disant que je devais moi-même le découvrir.

La partie s'est alors achevée par un score habituel que ma dignité m'oblige à ne pas révéler ici. Je cherche toujours le défaut de Jean Loup.

La vie de notre association se poursuit néanmoins, et les relations Franco-américaines dans le domaine du nucléaire se développent plus que jamais, grâce à l'action de nos 3 grands acteurs français du secteur que sont le CEA, AREVA et EDF.

Je voudrais simplement en citer ici très brièvement quelques exemples (dont certains font l'objet d'articles spécifiques dans ce numéro), avec le CEA d'abord qui vient de signer au plus haut niveau un MOU (Memo Of Understanding) avec le DOE (et avec la Japan Atomic Energy Authority) visant à mettre en œuvre des développements communs de la technologie des RNR à Sodium : principes de sûreté, objectifs de conception, innovation destinée à réduire les coûts en capital et en maintenance, etc. Ce partenariat, piloté par un Comité de Direction tripartite prévoit en outre le développement d'infrastructures communes de R&D, incluant des installations d'irradiation de combustible ou de tests de composants. C'est aussi AREVA qui consolide son implantation aux USA dans presque tous les secteurs du cycle du combustible avec par exemple son projet d'usine d'enrichissement de 3 MUTS mais aussi avec la poursuite de son programme MOX ou encore avec son implication étroite dans ses réponses aux appels d'offres lancés par le DOE dans le cadre du programme GNEP. C'est enfin EDF qui au travers de son partenariat stratégique signé en juillet 2007 avec Constellation Energy, projette de développer, réaliser, détenir et exploiter de manière conjointe des EPR aux états unis.

Ce sont bien entendu des signes forts qui montrent qu'une véritable renaissance du nucléaire est en marche outre atlantique. Toutefois, il ne faut pas ignorer que des obstacles ou des incertitudes demeurent, comme l'augmentation récente très sensible du coût de construction des centrales nucléaires (due en partie à la forte hausse des matières premières et des composants) ou l'impasse dans laquelle se trouve le dossier de Yucca Mountain, ou même les inconnues liées aux résultats des futures élections présidentielles de la fin de l'année (à l'heure où j'écris ces lignes, j'en profite pour signaler une conférence sur ce sujet de Jacques Figuière, notre Conseiller Nucléaire à l'Ambassade de France à Washington, prévue le 28 mai).

Prudence donc dans l'ampleur et le calendrier de cette reprise mais confiance aussi dans le renouveau durable de l'énergie nucléaire aux Etats-Unis, et donc dans le développement de nos échanges avec ce grand pays.

Bien Cordialement

Dominique Grenèche

## ► **Assemblée Générale : la jeune génération à l'honneur, la renaissance nucléaire américaine** **William Burchill, France Brès-Tutino – Membre du Bureau SFANS**

La SFANS/ Groupe France-Amérique a tenu son assemblée générale le 12 octobre au Cercle France-Amériques à Paris avec la participation exceptionnelle du Vice-Président de l'ANS, William Burchill, venu spécialement en France pour cette manifestation. - Il faut noter que les visites de La Hague et de Chalon effectuées à cette occasion ont fort impressionné le professeur Burchill qui a du reste publié dans le bulletin ANS NEWS un article très élogieux sur le nucléaire français

L'assemblée générale a élu le nouveau bureau avec le nouveau Président de la SFANS, Dominique Grenèche (AREVA) pour un mandat de deux ans, prenant la suite de Frank Carré (CEA). Le Président sortant a présenté aux membres de la SFANS le rapport moral et les faits marquants de l'exercice 2006-2007.

Il a notamment souligné que « l'actualité a été riche en événements pour l'énergie nucléaire de part et d'autre de l'Atlantique. Plus que jamais, elle souligne les liens forts qui existent entre les Etats-Unis et la France pour relancer l'énergie nucléaire et la développer... » Après avoir mis en avant les temps forts de la coopération franco-américaine, il rappelle que : « Le contexte actuel, porteur pour le nucléaire, donne tout son sens aux initiatives de la SFANS pour favoriser les échanges sur les questions nucléaires entre les Etats-Unis et la France.

Echanges d'information avec notre Newsletter et notre site Internet. Echanges plus techniques avec l'accueil en France de certains *Topical meetings* de l'ANS ou le parrainage croisé de conférences spécialisées, voire, certaines années avec l'organisation de visites de sites nucléaires français pour des professeurs américains. Echange d'étudiants enfin, qui prépare le nucléaire du futur et dont je me réjouis de la très bonne représentation à notre Assemblée Générale. »



*Le Vice Président de l'ANS, William Burchill et les membres du nouveau bureau de la SFANS : de gauche à droite, France Brès-Tutino, Rosine Couchoud, Alain Kavenoky, Frank Carré, Président sortant, Jean-Claude Yazidjian, Secrétaire Général, William Burchill, Dominique Grenèche, Président élu, Edouard Hourcade, Jeune Génération, Jean-Claude Gauthier, Vice Président et Boris Supiot.*

Il faut en effet reconnaître une forte participation de la Jeune Génération parmi une nombreuse assistance qui comptait non seulement des membres de la SFANS du secteur nucléaire scientifique et industriel, des

représentants des différents ministères intéressés et de l'ambassade des Etats-Unis ainsi que des adhérents de la *French American Foundation*.

Afin de mieux faire connaître les échanges d'étudiants organisés par la SFANS entre la France et les Etats-Unis, l'ordre du jour de l'assemblée comportait les exposés de deux stagiaires faisant le bilan de leur séjour, l'un aux Etats-Unis, l'autre en France : Thibault Faney de l'Ecole des Mines de Paris (ENSMP) faisait part de son expérience au MIT, enrichissante au plan scientifique, culturel et humain.



Julie Tucker de l'université du Wisconsin tirait les enseignements très positifs du stage de quatre mois qu'elle avait effectué à Saclay.



*William Burchillet Julie Tucker*

De plus, Pauline Gentner de l'Ecole des Mines de Paris (ENSMP), lauréate du prix SFANS 2006, rendait compte de sa participation au Summer Meeting de l'ANS à Boston en juin dernier au cours duquel elle avait pu assister à des sessions intéressantes et mieux connaître le milieu nucléaire américain et international.



L'assemblée générale était ensuite l'occasion de donner la parole au Vice Président de l'ANS, William Burchill qui donnait une conférence sur « *The US Renaissance and the importance of the French Connection* ».



*La French-US Connection* s'avéra très efficace à l'aune des nombreuses questions qui suivirent...

## ➤ **Nouveau Bureau**

**Président :** Dominique GRENECHE / Areva  
**Vice-président :** Jean-Claude GAUTHIER / Areva NP  
**Secrétaire :** Jean-Claude YAZIDJIAN / Areva NP  
**Trésorier :** Jean-Paul CHABARD / EDF

**Membres :** Franck BOCQUET/Areva NP, France BRES-TUTINO, Rosine COUCHOUD/Ministère des Affaires Etrangères, Michel DEBES/EDF, Jacques de la FERTE, Edouard HOURCADE/CEA, Alain KAVENOKY/CEA, Boris SUPIOT/Areva NP, Bernard JOLLY/SFEN, Dominique WARIN/CEA, Pascal YVON/CEA.

*Nous vous informons avec une profonde tristesse du décès le 28 décembre 2007, de notre ami Jean-Loup Rouyer. A 62 ans, il continuait à lutter avec courage contre la maladie qui l'avait frappé il y a plusieurs années.*

*Diplômé de l'Ecole Polytechnique, il entre en 1975 au CEA comme ingénieur-chercheur chargé de la protection de l'environnement et notamment de volcanologie au sein de l'IPSN.*

*En 1982, il devient chef de l'Unité de génie robotique avancé puis en 1989, directeur délégué à la propulsion nucléaire, chargé des programmes de chaufferies nucléaires des sous-marins et porte-avions.*

*Il rejoint EDF en 1990 où il occupe différents postes à haute responsabilité technique au SEPTEN, au CNEN puis à l'état-major de la Division ingénierie nucléaire jusqu'en 2005, chargé des systèmes énergétiques du futur.*

*Membre du bureau de la SFANS, il participe activement à la coopération nucléaire franco-américaine et assure aussi pendant plusieurs années la fonction de trésorier de notre Section.*

*Depuis lors, comme ingénieur-conseil, il participait notamment aux programmes énergétiques des pays en voie de développement.*

*Que ce soit au CEA, à EDF ou à la SFANS, il était reconnu pour son haut niveau d'expertise, la qualité de ses relations humaines et son profond charisme.*

*De plus, tennisman de classe internationale, il était numéro 3 de l'équipe de France engagée dans la coupe Davis.*

## ► **AREVA, un acteur majeur dans le recyclage du plutonium américain d'origine militaire**

**J.P. Bariteau, P. Bernard, J. Krellmann**

Après la période de la course aux armements nucléaires et de la guerre froide, les Etats Unis et l'URSS à l'époque ont engagé d'abord, dans les années 70, le processus SALT (Strategic Arms Limitation Talks) de limitation des armes stratégiques, aboutissant aux accords SALT- I et II, puis, dans les années 80, le processus START (Strategic Arms Reduction Talks) conduisant aux accords START-I en 1991 et START-II en 1993. En 2000, les Etats Unis et la Fédération de Russie ont signé un accord sur l'élimination de 34 t de plutonium militaire par chacune des parties, et l'administration américaine a annoncé que les 34 t de plutonium militaire américain seraient recyclées dans les réacteurs civils à eau légère. Ce programme se matérialise par la construction en cours de l'usine MFFF (MOX Fuel Fabrication Facility) sur le site de Savannah River en Caroline du Sud. Cette usine se présente comme une duplication de l'usine MELOX d'AREVA NC, pour la partie dédiée à la fabrication du MOX, et l'usine comprend également en amont un atelier de procédé chimique dupliqué également d'installations existant à La Hague, dans le cadre d'un transfert de technologie vers le DOE (Department of Energy). Les assemblages MOX qui seront produits par MFFF seront ensuite utilisés notamment par l'électricien Duke Energy dans ses réacteurs REP. Le DOE attribué en

1999, au consortium DCS, regroupant à l'époque Duke Energy, COGEMA et Stone&Webster, la conception de l'usine MFFF, consistant à l'"américaniser" à partir de celle des usines françaises, notamment à adapter les équipements au plutonium militaire, à prendre en compte les contraintes locales du site, et à intégrer les données technologiques américaines.

Dans le même temps, pour qualifier le combustible qui sera fabriqué dans l'usine MFFF, le DOE a retenu le principe de faire fabriquer, puis irradier dans un des réacteurs de Duke Energy, quatre assemblages de combustible MOX représentatifs de la production de MFFF. AREVA NC a remporté l'appel d'offre pour la réalisation (programme EUROFAB) de ces assemblages dans ses usines de Cadarache et de MELOX, utilisant l'oxyde de plutonium de qualité militaire fourni par le DOE. Cette matière a été reçue à Cadarache en octobre 2004, et les crayons MOX y ont été fabriqués, puis transportés à MELOX où la réalisation des assemblages a été menée à partir de janvier 2005, et les quatre assemblages MOX, de conception AREVA NP, ont quitté MELOX en mars 2005 à destination des USA, ont été chargés en réacteur à Catawba en juin 2005, et en sont à ce jour à leur second cycle dans le coeur du réacteur.

L'usine MFFF est désormais en phase de

construction effective depuis août 2007, et la maîtrise d'œuvre en est assurée par le consortium SA MOX Services, regroupant Shaw et AREVA, remplaçant DCS depuis 2006. L'ensemble de ce programme « MOX-US » se

poursuit donc avec succès, et il constitue sans aucun doute une réussite majeure pour AREVA NC, qui illustre l'intérêt du recyclage des matières nucléaires énergétiques comme le plutonium.

## ► **AREVA application for U.S.EPR Design certification accepted by U.S. NRC**

**Jean Claude Gauthier AREVA NP**

February 28, 2008

AREVA's design certification application for the U.S. Evolutionary Power Reactor (EPR) has been accepted for technical review by the U.S. Nuclear Regulatory Commission (NRC) ahead of schedule. This early acceptance further demonstrates progress towards the completion of the first EPR to be deployed in the United States by 2015. The NRC staff determined that the content of the design certification (DC) application met the acceptance criteria for the safety review to begin. The NRC's October audit of AREVA's application was important in helping the NRC reach the conclusion today that no open items need to be resolved before the review begins.

*"Our commitment to our customers and the industry is to provide the path of greatest certainty toward safe, affordable, new baseload generation in the United States by the end of 2015,"* said Ray Ganthner, AREVA NP Inc. Senior Vice President for New Plants Deployment. *"The timely submittal and now acceptance of a high-quality, complete DC application are important milestones in helping us fulfill that vision."* Ganthner attributes the

quality of the design application to the comprehensiveness of the global EPR design now under construction in Finland and France.

Formal acceptance and docketing of the U.S. EPR design certification application, prepared by AREVA and submitted to the NRC in mid-December 2007, is closely linked to the agency's acceptance of UniStar Nuclear Energy's combined operating license (COL) application for a proposed U.S. EPR at a site adjacent to Constellation Energy's Calvert Cliffs Nuclear Power Plant in Lusby, Md. UniStar submitted a portion of the COL application in July 2007 and plans to submit the remainder of the COL application in March. Review of AREVA's DC application is likely to conclude in 2010. In early February, UniStar Nuclear Energy announced the engagement of a consortium between AREVA and Bechtel Power to begin initial development of the detailed design engineering that will form the basis for future U.S. EPR advanced nuclear power plants in the United States.

## ▶ **AREVA and Bechtel Move Forward with Initial Detailed Design Engineering of U.S. EPR**

**Jean Claude Gauthier AREVA NP**

February 08, 2008

UniStar Nuclear Energy, a strategic joint venture between Constellation Energy and the EDF Group, has officially commenced the detailed engineering design for the Calvert Cliffs Unit 3 nuclear power plant in Maryland by awarding a contract to the consortium of AREVA and Bechtel power Corporation.

In the process of deploying a new plant, the detailed design engineering is a major milestone toward deployment of a new plant. It generates the tangible construction drawings and detailed specifications that are necessary to buy equipment and build the plant. This effort will engage the services of more than 200 AREVA and Bechtel engineers.

*“With the design certification application (DCA) submittal and UniStar’s combined operating licence application (COLA) on track, we are now*

*beginning the next major step on the path of certainty toward commercial operation of the first U.S. EPR”* said Ray Ganthner, AREVA NP Inc. senior vice president for New Plants Deployment.

As they enter this phase of the process, the AREVA-Bechtel team will benefit from the advanced design of two separate EPRs currently under construction in Finland and France. In addition, independent COLA projects are underway in parallel for the deployment of the EPR at other U.S. locations. AREVA hired more than 200 engineers and technical experts last year to support the DCA and detailed design activities, and will hire even more this year in preparation for the high demand of resources necessary for new build plans in the U.S.

## ▶ **International Nuclear Recycling Alliance (INRA) answer to DOE's GNEP**

**Dorothy Davidson – AREVA Inc, Shigeru Kunishima - Mitsubishi**

The U.S. Department of Energy (DOE) “determined that it is in the best interest of the public to solicit input from the nuclear industry regarding approaches to closing the fuel cycle” that meet the Global Nuclear Energy (GNEP) goals. In April, DOE released a funding opportunity announcement (FOA) requesting “applications from industry on endeavors to explore the technical and business parameters supporting GNEP” by providing studies in these main areas:

- ✓ business planning
- ✓ conceptual design studies
- ✓ technology development roadmaps



These studies provide what industry can do and what could be privately financed, as well as identification of needed R&D to close the fuel cycle. The output from the GNEP studies will provide input and recommendations to the Secretary Energy Record of Decision

In response to the FOA and to meet the Global Partnership aspects of GNEP, AREVA formed the International Nuclear Recycling Alliance (INRA) – an international consortium of experts to perform the studies regarding closing the fuel cycle. INRA is led by AREVA, operator of the world's longest-running and largest nuclear fuel recycling facility – La Hague; and MHI, a world leader in advanced, fast reactors (MONJU and JOYO). Other members of INRA include Japan Nuclear Fuel Limited, operators of the Rokkasho Mura Recycling Facility – the world's most recently designed and constructed recycling facility; Battelle Memorial Institute, leaders in technology innovation; Babcock & Wilcox Technical Services, experts in the protection of US nuclear assets; and URS Washington Division, one of the largest engineering, procurement, construction (EPC) contractors in the US.



Figure 1. INRA Team

INRA formed a Utility Advisory Panel (UAP) to get industry input and to validate INRA's approach. The UAP was comprised of 10 U.S. utilities representing 64% nuclear generation in the U.S.; EdF; and 11 Japanese utilities.

INRA just completed Phase 1 on February 28th. Draft reports have been submitted to DOE. Following is a brief discussion of our approach in the areas under the FOA.

### **Consolidated Fuel Treatment Center (CFTC)**

The objective of the CFTC conceptual design studies is to evaluate the design for a commercial nuclear fuel recycling center including scope, cost, and schedule information. DOE requested detailed information on the engineering analysis and design, including construction and operation, and the regulatory and licensing of the facilities.

### Key Take-Aways

- ✓ Performed initial studies on 3 configurations to determine preferred initial plant size (150-tHM/yr demonstration plant; 800-tHM/yr commercial scalable; and 2500-tHM/yr fully commercial plant).
- ✓ Selected 800-tHM/yr facility as preferred size, beginning operations in 2023.
- ✓ Initial CFTC operational by 2023 using state-of-the-art processes and equipment.
- ✓ Flexible design allows incorporation advanced technologies as they mature.
- ✓ Licensing is critical path
- ✓ Work with DOE/National Laboratories about constructing pilot plant for demonstrating advanced separations at CFTC.
- ✓ Additional investigation is required in the area of gaseous effluents.

INRA draws on over 40 years of experience, especially experience gained at La Hague and Rokkasho Reprocessing Plant, in defining a design for the initial CFTC.

During evaluation of the facility, INRA considered facilities with capacities from 150tHM/yr to 2500tHM/yr. Each of the facility scenarios was designed utilizing the state-of-the-art separations process, COEX™. COEX™ also offers the benefit of relying on conventional process technology that is commonly used in commercial recycling facilities to recycle UNF without separating a pure Pu stream.

INRA evaluated all three of these CFTC deployment scenarios to determine the best solution based on economics, including market desire for recycled

products, reducing the risks of diversion or theft of weapons-usable material, impact on the geological repository, reducing the UNF inventory in the U.S., and political acceptance. INRA believes there is no “silver bullet” that optimizes all of these objectives – each one has its own pros and cons. Based on our evaluation, however, INRA believes that a commercially scalable CFTC with a capacity of 800-tHM/yr is the most attractive option. The 800-tHM/yr CFTC should be scaled up to meet future market demand and technology advances.

The primary purpose of the technology development roadmap was to document technology readiness. INRA determined that technology exists that is commercially demonstrated or at a level of development that supports a commercial recycling plant. Additionally, we proposed technology options to facilitate licensing, reduce costs, and improve the geologic repository performance. The GNEP ultimate goal is to close the fuel cycle. To further optimize the geological repository beyond a densification factor of 4-8, INRA believes advanced separation, especially removal of Am, is required. INRA plans to work closely with CEA, JAEA and the US National Laboratories during Continuation 1 to identify areas for technology enhancements including advanced separation of minor actinides, especially Am, and capture of Kr-85 and I-129.

### Advanced Recycling Reactor (ARR)

For the ARR, INRA chose to jump start development by taking advantage of international R&D programs and use the JAEA’s Sodium Fast Reactor (JSFR) as a reference. INRA believes that technology exists to build a sodium-cooled fast reactor now but R&D is needed to make it cost-competitive with a similar size LWR. The proposed ARR development strategy includes a 500 MWe demonstration plant (ARR1), which will be operational in 2025; a 1000 MWe commercial plant, which will be operational in 2035

(ARR2); and a 1500 MWe full-scale commercial plant, which will be operational in 2050 (ARR3). This approach is conservative and has the advantage of maintaining a technology base developed over 4 decades, allows time to assure and verify the commercial reliability of a sodium reactor, incorporates technical innovations, and integrates well with the U.S. approach to implement conventional and advanced recycling.

#### **Key Take-aways**

- **Japan and France have ongoing R&D programs for SFRs; our design can benefit from this development effort**
- **Technology selected as the starting point for the U.S. ARR pre-conceptual design is JAEA's Sodium Fast Reactor (JSFR) technology.**
- **13 Technology enhancements were identified which improved safety, cost, and reliability of the reactor and supported the commercialization of the SFR.**
- **INRA proposes to work with DOE on the legal and contractual frame under which R&D could be shared with the National Laboratories in the U.S., Japan, and France and solve issues related to intellectual property and export control.**
- **INRA proposes a series of working groups made up of the DOE/National Laboratories, INRA, JAEA, and CEA to explore where international cooperation could be achieved and identify the infrastructure necessary to rebuild the test facilities in the U.S.**

Development of sodium fast reactor (SFR) technology began more than 40 years ago. Since that time, more than 20 prototypes and pre-commercial scale units have been designed, constructed, and operated in 9 countries. This experience makes SFRs the most advanced technology and strongest foundation to build an Advanced Recycling Reactor (ARR) today, and provides DOE with the most confidence in meeting GNEP goals of plutonium (Pu) management, minor actinides (MA) destruction, and electricity production.

The current design is not economical or efficient compared to current LWRs; as a result, 13 enhancements have been identified by JAEA to improve safety, reliability, and economics of the current technology. INRA proposes using a step-

wise approach for implementing commercial ARR. This approach is similar to that used for LWRs; as LWR design enhancements were proven and incorporated, there was a resulting increase in reactor power. This step-wise engineering successfully controlled an increase in reactor size, ensured that safety protocols were met, and guaranteed the reliable design of the LWRs currently in operation.

## **Business Planning**

During Phase I, INRA analyzed the economics and business strategies for the CFTC and ARR. The first step is the formation of an integrated used fuel management strategy in the U.S. We have determined that a government-owned Used Fuel Management Entity (UFME) should be formed to manage the entire backend of the fuel cycle, including recycling and the geological repository program. Such an entity needs broad authority to enter into contractual relationships with the service providers. We have identified several organizational models for such an entity to ensure sound management. This entity would make the recommendation on the used fuel management strategy (i.e., whether recycling is pursued in the U.S.) If recycling is implemented, a recycling company, with private participation, should be formed for the development and operation of the recycling plants. The contract between the recycling

company and the UFME is a key component of the business structure; an appropriate contractual structure could make the recycling project bankable, allowing for third-party financing. Short term (pre-UFME, 2009-2013) financing of the recycling venture could be accomplished through debt financing, if government loan guarantees are provided.

Based on INRA's analysis and conversations with key stakeholders, including 2 large financial institutions that INRA has engaged during the course of the project, INRA believes that the commercial portion of the UNF cycle, which includes commercial recycling of UNF and development of a geologic repository, should be managed in a business-like fashion, distinctly different from government program management, and designed to meet 3 objectives; 1) constitute an independent entity 2) obtain the authority to enter into commercial contractual relationships, and 3) retain oversight from the utilities.

In addition, activities that fall under the category of technology development, such as the ARR demonstration program, and scientific research, such as studies and tests of advanced separation technologies, are more appropriately handled by the DOE directly, and more in character with DOE's traditional mission and responsibilities, until such time that those technologies can be implemented commercially and make economic sense. In particular, it is expected that, once advanced reactors can be built commercially, electric utilities will build them in a similar fashion as they do today with LWRs.

## **Conclusion**

Based on the results of the studies, INRA believes that recycling should be considered as an option to direct disposal to provide an integrated used fuel management strategy in the U.S. The utilities, as end-users, are key to this strategy. Closing the fuel cycle will require a long-term policy and close cooperation between the utilities, suppliers (i.e., recycling and reactor vendors), the national laboratories and the government. INRA is pleased to industry's input to information needed to make an informed decision regarding closing the fuel cycle.

## **➤ The EDF and Constellation Energy joint venture in United States**

**Michel DEBES, EDF**

The EDF and Constellation Energy partnership was announced in July 2007. The aim of this 50/50 joint venture, named UNISTAR NUCLEAR ENERGY, with the American electric utility Constellation Energy who is a leading actor in the sector in North America, is to establish a long-term strategic joint venture

which enables to lay down milestones to contribute to nuclear power renewal in North America. The United States energy market constitutes the world's leading energy market. It is faced with growth in demand and there is a great need to build new generation capacities, which is estimated at 350 GW by the year 2030.

Nowadays, nuclear power accounts for 19% of American electricity generation in an energy mix dominated by fossil generation fired by coal and natural gas. The need to strengthen energy security and requirements related to climate changes have resulted in the American authorities fostering the contribution of nuclear power, which does not emit CO<sub>2</sub>. At present, more than 30 nuclear projects using several different technologies have been announced in the United States.

The purpose of UNISTAR NUCLEAR ENERGY is to jointly develop, build, own and operate nuclear power plants of EPR type in the United States, and within this framework EDF has now become an investor in the United States. This partnership will benefit from the cooperation which has been established since two years between AREVA and Constellation within UNISTAR, which has enabled the EPR to be recognized as an advanced, evolutionary, safe and competitive design.

EDF will contribute to this partnership with its expertise built up from the accumulated experience of operating its 58 reactors and the construction underway of the EPR at Flamanville which is to be commissioned in the year 2012. This is good news for the French industry and the nuclear sector as a whole since EDF is going to participate in the development of new nuclear power plants, using the EPR technology developed by AREVA, and will thus contribute to the construction of the first fleet of new nuclear power plants in the United States since thirty years. This constitutes an opportunity for the EDF Group to speed up skills

renewal embarked upon to build new plants when the time comes. Over the next ten years, on an annual basis, EDF will recruit around 500 recently qualified engineers for nuclear power generation and engineering.

The EDF development in the United States through Constellation Energy is then the most effective method for successfully setting up new EPR plants in US. EDF and Constellation Energy are both electric utilities and plant operators. Therefore, the two groups will be both EPR plant operators, with respective skills that are highly complementary. EDF will therefore become the co-owner of American nuclear power plants with the associated involvement in terms of nuclear safety. As stipulated in American legislation, responsibility in terms of nuclear safety will however be borne by our American partner who will be backed up by our expertise and reliable operational experience feedback.

EDF know-how focuses on operating nuclear power plants, ownership, project management and engineering and AREVA will develop the EPR design and technology and manufacture nuclear components.

Within the agreement, the sites provided by Constellation can house 4 EPRs, enough to gain a series effect, beginning with Calvert Cliff. At the end of 2007, an application for certification of an EPR model was submitted to the competent American authorities. Providing all goes well with this process, the initial EPR model could be commissioned in 2015.

EDF and Constellation will also study together common opportunities to invest in the energy

sector in US and Canada.

▶ **The Materials Ageing Institute**  
**Jean-Pierre HUTIN, Jean-Marie BOURSIER**  
**EDF Research & Development**



*On January 10 2008, the Materials Ageing Institute was created with the signature of a Consortium Agreement by the founding members: EDF, TEPCO (Tokyo Electrical Power Company) and EPRI (Electric Power Research Institute) which represents 35 nuclear utilities, including all US nuclear operators. The objective of this Institute is to develop and share knowledge related to ageing of materials used in power plants.*

*The Programme Committee decided the R&D program for 2008. Nine projects have been selected, from about 20 proposals presented by the members, the total budget rising to 8.8 M€.*

- **Why the Materials Ageing Institute?**

In front of the energy challenges, the nuclear option remains one of the most effective solutions. It is then necessary to get ready to design and built new facilities while operating existing plants as long as possible, in a safe and cost-effective manner. This requires to keep ageing of materials, components and structures under control.

In this area, EDF developed a strong expertise based on a unique experience feedback (more than 1000 reactor-years). Major progress has been performed in recent years but there is still work to be done in order to be able to **understand, simulate and predict all degradation mechanisms** which could affect materials used in power plants.

**But it would not be reasonable to stand alone in front of such a challenge. Only putting together resources and competencies with utilities facing the same issues will allow solving these complex scientific questions and guaranteeing the validity of the results.**

That is why EDF decided to create, on its Renardieres site, an international institute dedicated to materials ageing: the M.A.I.

- **A Research Centre with well known partners :**

- Utilities (or organizations representing utilities) who are permanent Members and share the same concerns like EPRI (Electric Power Research Institute representing US electric utilities) and TEPCO (Tokyo Electric Power Company). Negotiations continue with other companies: KANSAI (Japan), British

Energy (UK), ENEL (Italy), UNESA (representing Spanish utilities), ESKOM (SAR), KHNP (Korea), etc;

- Associate Members joining MAI efforts on specific issues;
- Scientific partners bringing their expertise and insuring a high level of excellence and quality: CEA (France), VTT (Finland), CIEMAT (Spain), Ecole des Mines, universities of Grenoble, Lille, Rouen, Manchester (UK), INL (USA), etc.

- **Training and education are organized for various populations :**

- Courses about materials ageing for students;
- Training for utilities and power plant employees;
- **Seminars and conferences to favour sharing of knowledge and ideas.**

- **New means for new ambitions**

EDF invested more than 15 M€ to have sophisticated equipments, particularly three electronic microscopes of the last generation. Powerful numerical simulation tool (Blue Gene L) will allow to go from understanding to predicting materials degradation and also to capitalize knowledge.

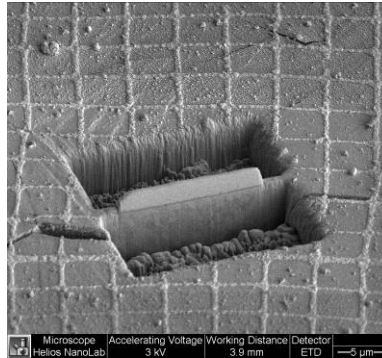
A new building will welcome researchers and accommodate new equipments, while respecting EDF commitment to environmental concern (High Environmental Quality standard).



- **A scientific program of interest to all partners**

Many scientific areas of common interest have been identified: corrosion, fatigue, effect of irradiation, ageing of concrete, physical and chemical ageing of polymers, etc. The MAI will address issues related to materials of existing plants but also those of future reactors (generation 3 and 4), of fossil fuel plants and of hydraulic facilities.

Results are to be used by MAI members to assess the risk of ageing of their own equipments, thus contributing to more effective and safer operation, maintenance and asset management.



*Sample preparation for electronic microscope observation*

## ► **Les Candidats à l'élection Présidentielle Américaine et le nucléaire : Positions et Perspectives**

**Sophie PREVOT et Jacques FIGUET- Ambassade de France à Washington**

On retiendra du bilan de l'administration républicaine Bush en matière de promotion du nucléaire :

- le programme NP 2010, qui visait à relancer de premières nouvelles constructions de réacteurs, avant la fin de la décennie,
- la loi sur l'énergie de 2005, votée après de longues et laborieuses négociations par le Congrès, mais qui inclut, au final, des dispositions essentielles pour soutenir les premiers projets, dont les fameux « loans garanties »,
- l'ambitieux programme Global Nuclear Energy Partnership, qui a permis de rouvrir le débat de la fermeture du Cycle aux Etats-Unis,

Ce bilan positif, d'autant qu'il a été obtenu dans un cadre très souvent bipartisan, reste cependant entaché par l'inaptitude de l'administration à faire avancer le projet Yucca Mountain.

La nouvelle administration, qu'elle soit de nouveau républicaine ou bien démocrate, aura fort à faire dans les années qui viennent. Leur plus gros défi sera sans aucun doute Yucca Mountain, que les Candidats démocrates, Hilary Clinton et Barack Obama ont tous deux, à plusieurs reprises, déclaré vouloir abandonner. Hilary Clinton propose de reprendre à zéro le processus de sélection d'un site, tandis qu'Obama reste plus ouvert en s'en remettant à un comité d'experts indépendants, suggérant que le Département de l'Energie (DOE) et le



Congrès recherchent un autre Etat volontaire pour un site national ou bien que des centres de stockage régionaux soient mis en place. Seul le candidat républicain, John McCain supporte la mise en place du site en qualifiant le projet de sûr et de nécessaire, afin de libérer les électriciens des déchets, actuellement entreposés sur les sites des centrales, et de respecter les obligations prises par l'administration.

McCain a largement intégré l'énergie nucléaire comme une source cruciale d'énergie pour le futur. Son plan dénommé « Manhattan project » consiste à rendre les Etats-Unis autosuffisants en matière de pétrole en quelques années. La relance du nucléaire est un élément clé pour y parvenir et le stockage des déchets doit avoir été traité.

Ce soutien est bien moindre du côté des candidats démocrates, car le nucléaire s'intègre mal dans la sensibilité de leur électorat. Bien que l'Illinois, Etat dont il est sénateur, soit un état comparable à la France en terme d'équipements (11 réacteurs pour 12.8 millions d'habitants), Barack Obama reste très prudent quant à la place du nucléaire dans sa future politique énergétique. Il déclare simplement ne pas voir d'objection à son développement, sous réserve que le devenir des déchets soit solutionné et que cette technologie soit capable de s'implanter économiquement, dans un panel énergétique diversifié intégrant les ENR. Il a reconnu par ailleurs l'intérêt du nucléaire, dans le cadre de la lutte contre le réchauffement climatique.

Hillary Clinton semble aujourd'hui la candidate la moins en faveur du nucléaire. Ses positions

sont sans doute destinées à se démarquer de son rival démocrate dans les primaires en cours et aussi pour se ménager le vote des électeurs de son état (New York State), dont beaucoup restent opposés au maintien en opération de la Centrale d'Indian Point, située à quelques dizaines de miles de New York City. Elle a ainsi déclaré être « agnostique » en la matière et refuserait de soutenir la construction de nouvelles centrales, tant que le problème des déchets ne sera pas réglé. Elle est opposée aux subventions dont le nucléaire bénéficie, son attitude sceptique étant, selon ses déclarations, justifiée par les questions de sûreté et de sécurité des installations existantes, de prolifération et des coûts de construction et de production trop élevés. Si elle n'inclut pas dans son plan énergétique la construction de nouveaux réacteurs, elle n'exclut pas cette possibilité si des solutions devaient être apportées à l'ensemble de ces problèmes.

Si la position des candidats toujours en lice semble assez différenciée sur le nucléaire, ce dernier n'a pas constitué un vrai thème de campagne, contrairement au thème du changement climatique qui a bien davantage amené les candidats à s'exprimer. C'est parce que la primaire du Nevada avait été anticipée (sans doute sciemment), avant le Big Tuesday (où une vingtaine d'états devaient se prononcer), que cette primaire a été particulièrement médiatisée et a amené les candidats démocrates à s'engager plus fermement sur Yucca Mountain et en amont sur la question de l'utilisation du nucléaire dans son ensemble. Seule la politique du cycle semble encore un point de clivage entre experts des

candidats républicain et démocrates. Leurs prises de position, souvent ambiguës sur leur soutien au nucléaire, restent cependant destinées à laisser la porte ouverte à plus de réalisme. Ainsi, lorsque le nouveau Président

sera en fonction, ses objectifs sur la lutte contre le changement climatique nécessiteront d'utiliser toutes les solutions pour parvenir à respecter ses engagements.

## ► **Communicating Benefits of Nuclear Energy Increases U.S. Public's Support**

**Ann S. Bisconti – Bisconti Research Inc.**

*April 2008*



**Ann Stouffer Bisconti** is President of Bisconti Research, Inc. She provides research and communications advice to many companies and organizations in the U.S. and abroad.

*Dr. Bisconti was previously a vice president with Nuclear Energy Institute (NEI), where she directed*

*one of the most comprehensive research programs ever undertaken by an industry on challenging social issues. Bisconti Research continues to conduct NEI's public opinion and communications research under contract and serves many other clients in energy and other fields.*

*Dr. Bisconti attended Harvard University, McGill University, and The Union Institute, from which she received her Ph.D. in Social Science Research in 1977. She is listed in Who's Who in America. Dr. Bisconti was twice elected to the Board of Directors of the American Nuclear Society (ANS). She is the author of five books and many other publications.*

U.S. public opinion toward nuclear energy has become quite favorable in recent years, and a new national poll this April shows continued support. Nearly two-thirds (63 percent) favored nuclear energy, 59 percent supported definitely building more nuclear power plants in the future, and 66 percent said that they would find it acceptable to add a new reactor at the nearest nuclear power plant site. Public support is due to a general sense that we need nuclear energy, coupled with growing awareness of the benefits that nuclear energy provides.

To understand public attitudes, Nuclear Energy Institute (NEI) has sponsored public opinion surveys on nuclear issues for 25 years. The surveys, with nationally representative samples of 1,000 U.S. adults, have a margin of error of plus or minus three percentage points. Bisconti Research conducted the latest survey with GfK April 10-13, 2008.

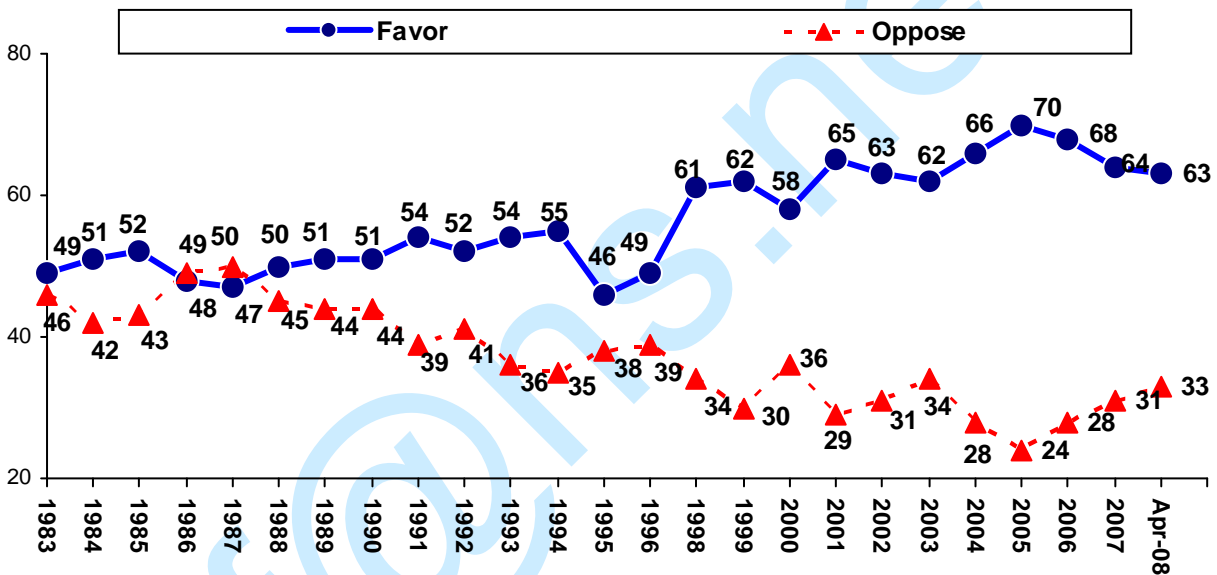
**Public Favorable to Nuclear Energy and New Plants**

The long-term trend shows a widened gap between those who favor and oppose nuclear energy. In the early 1980s, the public was divided about equally between supporters and opponents. In recent years, supporters typically outnumber opponents by about 2 to 1.

A majority of the public does not hold strong opinions, so constant communications are essential. Currently, those who strongly favor nuclear energy outnumber those who are strongly opposed by 28 percent to 14 percent. Research shows that many of those who voice strong opinions are, in fact, changeable.

**Percent Who Favor and Oppose Nuclear Energy: Annual Averages Until 2008**

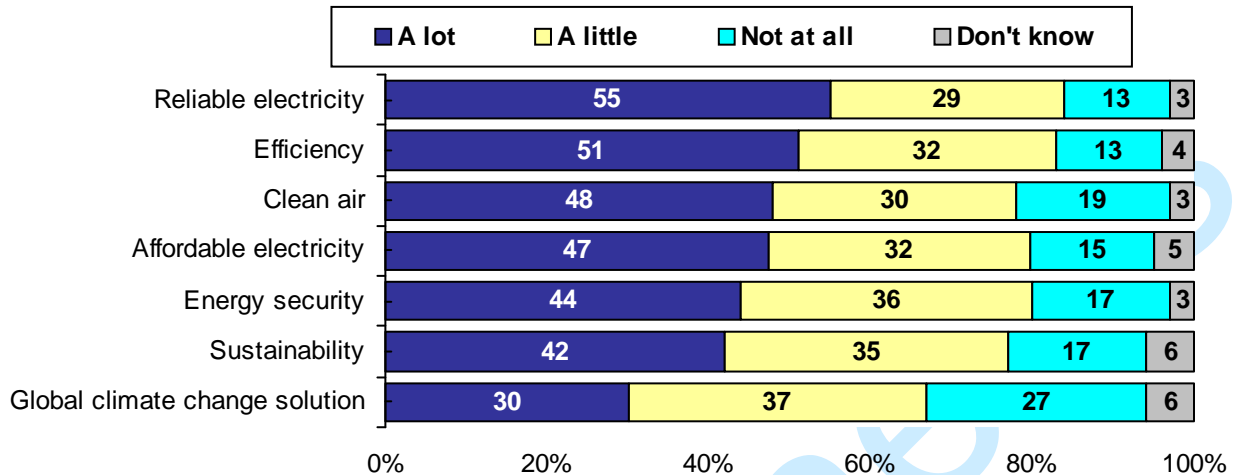
*‘Overall, do you strongly favor, somewhat favor, somewhat oppose, or strongly oppose the use of nuclear energy as one of the ways to provide electricity for the United States?’*



Support increases with awareness of the need for nuclear energy and its benefits. Currently, about half the public associates nuclear energy “a lot” with reliability, efficiency, affordability and clean air. There is less recognition that nuclear energy is a solution to global climate change. For many Americans, global climate change is a new concern and one surrounded by considerable confusion.

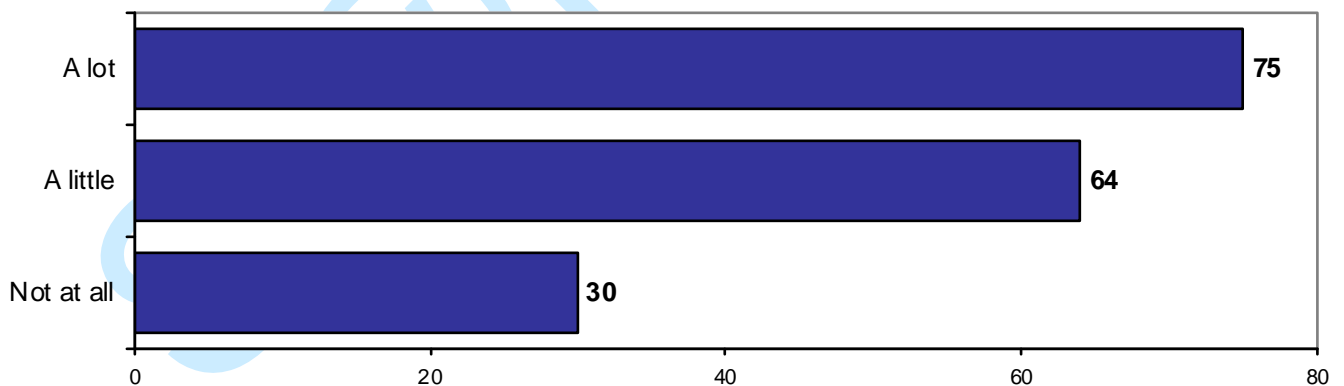
## Association of Nuclear Energy with Benefits: April 2008

“Do you associate nuclear energy a lot, a little, or not at all with...”



The more people link these benefits with nuclear energy, the more they favor its use. For example, of those who associate nuclear energy “a lot” with clean air, 75 percent favor the use of nuclear energy. In contrast, of those who do not associate nuclear energy at all with clean air, only 30 percent favor the use of nuclear energy.

### Percent Favor Nuclear Energy, by Association of Nuclear Energy with Clean Air



The U.S nuclear industry led by NEI uses a multimedia approach to communicating these benefits, including advertising, media relations, blogs, and credible spokespersons. Increasingly, nuclear professionals are engaged in communications through ANS, Women in Nuclear (WIN), and North American Young Generation in Nuclear (NA-YGN).

Perceptions of nuclear power plant safety are also important—more so than waste—because many people, even supporters, remain concerned about the “what if” accident. In April, 66 percent rated nuclear power plants safe (5-7 on a 1-7 scale). Half (49 percent) had heard or read something during the past year about the safety of nuclear power plants, and 67 percent of them said that the information they heard was mostly favorable. Of those who had heard or read something favorable about nuclear power plant safety, 83 percent favored the use of nuclear energy.

### **Challenges at the National Level**

Two significant communications challenges face the U.S. nuclear industry at the national level—one old and one new. The old challenge is the persistent perception gap. While a majority of Americans favor nuclear energy, many believe that a majority of the public is opposed. As of April, 24 percent perceived that the majority of people in their community were in favor of nuclear energy, 46 percent viewed the majority as opposed, and 30 percent had no idea. This perception gap shows that a stigma still attaches to nuclear energy.

The new communications challenge results from the dramatic increase in media attention to the promise of solar and wind energy. In addition to news coverage, many corporations advertise heavily their commitment to solar and wind energy to raise their reputation with the public. All this attention has resulted in soaring public expectations for these energy sources and a diminished view of nuclear energy as fuel of the future.

From 1983 until 2007, NEI surveys asked in various ways about which sources would supply the most electricity to the U.S. in 10 or 15 years. Regardless of the question wording or the future

time frame, nuclear always came in first and solar second. In 2007, for the first time, solar was named more than nuclear energy as the major source 15 years from now. This April, nuclear was in fifth place, behind solar, wind, and natural gas and tied with hydropower.

Attitudes toward nuclear energy typically become more favorable when energy prices increase as they have recently in the U.S. Were it not for the high expectations for solar and wind, it is likely that support for nuclear energy would have spiked in the latest poll. Instead, support held steady.

Support appears to be sustained by the public desire to use all our energy sources and, especially, to reduce our reliance on fossil fuels. In fact, 84 percent in April agreed that “we should take advantage of all low-carbon energy sources, including nuclear, hydro, and renewable energy, to produce the electricity we need while limiting greenhouse gas emissions.” Because the association of nuclear energy with other carbon-free sources is so positive, it is a challenge to put into perspective the relative size of the contributions of the carbon-free sources without appearing to criticize any of the sources.

## **For New Plants, Local Support Matters Most**

As the U.S. prepares for possible new plant orders, it is local support that matters most. New plants will be built in locations where they are wanted. Two national surveys of plant neighbors in 2005 and 2007 by Bisconti Research for NEI found very favorable attitudes toward nuclear energy. In 2007, with a sample of 1,152 from the 64 U.S. nuclear power plant sites (excluding electric company employees):

- 82 percent favored nuclear energy—52 percent strongly in favor, 7 percent strongly opposed.
- 86 percent had a favorable impression of the nearby nuclear power plant—57 percent were very favorable, 4 percent very unfavorable.
- 87 percent had confidence in their electric company to operate a nuclear power plant safely.
- 71 percent said that a new reactor at the nearest nuclear power plant site would be acceptable.

These numbers are averages, and so they are lower near some plants and higher near others. They are grounded in familiarity with the plant and the people who work there, awareness of the large economic contribution of the plant to the local area, and positive perceptions of the benefits and safety of nuclear energy.

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**Note :** *A l'heure de la publication de ce numéro, nous apprenons l'élection de notre Président, Dominique GRENECHE, comme membre "non US" du "Board of Directors" de l'ANS, en tant que représentant pour l'Europe.*

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