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BREVE HISTORIA DEL DESARROLLO DE LA ENERGIA NUCLEAR EN PUERTO RICO

TECNOLOGIA VS. poLITicA

(1987-1981)

CENTER FOR ENERGY AND ENVIRONMENT RESEARCH

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BREVE HISTORIA DEL DESARROLLO DE LA ENERGIA NUCLEAR EN PUERTO RICO

TECNOLOGIA VS. POLITICA

(1957-1981)

Preparado por:

Lic. Justo £. Varela Dieppa, P.E.

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~ RECONOCIIITENTO -

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Introduceién

Durante un hist6rico discurso pronunciado en 1a Asanblea General de Jas Naciones Unidas e1 9 de dictenbre de 1953, el Presidente de los Estados Unidos, Dwight D. Eisenhower, enuneré por primera vez el plan ?Atoms para Ja paz", destinado a difundir los beneficios de 1a energfa nuclear por todo e1 mundo.

Hoy dfa, a pesar de Tos contratienpos surgidos en Ta década del 1970, 1 Stono se ha difundido por todo el globo terréqueo. En junio de 1901 estaban operando conercialnente para generar energia eléctrice aproxina~ ?danente 250 reactores, en centrales generatrices de sobre 30 "We, habiendo cerca de 285 on alguna etapa pre-operacional. Estas unidades tienen una capacidad neta en megavatios eléctricos de 408,098. (Ver Anejo 1).

Sin embargo, e1 desarrollo pleno se ha visto maculado por movinientos antinucleares de todo tipo. En adicién, 1a legislactén protectora del ambiente que empez6 a surgir, especialmente en los Estados Unidos, desde e1 1969 (NEPA) también puso freno al desarrollo de esta nueva eneraia en

Je fase de su utilizactén para centrales generadoras de electricidad.

A raiz del discurso del Presidente Eisenhower en el hemiciclo de Tas Naciones Unidas en e1 1953, e1 Congreso de Tos Estados Unidos ennendé 1a Ley de Energia Aténica de 1946 que no tenfa disposiciones para el uso pacf-fico de esta fuente incalculable de energia. En el 1954 se ennendé total-mente Ta Tey para autorizar a 1a Comisién de Energia Aténica (CEA), este blecida en e1 1986, adoptar reglas y sténdards pore inplenter un procedi= siento para Vicenciar Ta construcci6n y operacién de instalactones nu

cleares para usos pacfficos.

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En ei creciuviento del sistena regulador de 1a CEA pueden identi ficorse cistro periodos ¢e desarrotie. £1 prinero comenz6 con 1a aprobacién de 1a Ley de tnerafa Aténica de 1946; e1 segundo con 1a promulgacién de Ta Ley

?de 1954; 1 tereero con 1a enisién o concesién del priner permiso de construccién de un reactor de gran capactdad eneraética cerca de Monroe, Michigan (a 1a Power Reactor Development & Co.) en el 19573 y el cuarto con Ta aprobactén de Te Ley de Reorganizacion Energética de 1974, que abolié la CEA y transfirié todas sus funciones de Ticenciamiento y regulaciones a 1a recién

creada Comisién Reguladora tluctear (CRN).

£1 desarrollo de 1a energfa nuclear en Puerto Rico ha sido gobernado tanto por 1a CEA como por 1a CYR. Es la funcién principal de la CEA (y de Je CRN) el asegurarse que las actividades privadas relactonadas con 1a uti-Heactén de 1a energfa nuclear se conduzcan dentro de un marco de seguridad Fazonable para que el pablico y Tos trabajadores no sean sometidos innece= Sariamente a los riesgos de la radioactividad, ademfs de evitar que se con tamine el ambiente. Precisamente esta preocupacién es vital para que se apruebe 1a Ley de 1974 que abolié 1a CEA y creé 1a CRN, ya que para muchos as funciones pronocionales y reguladoras de la antigua CEA eran inconsistentes. Esta preocupactén toma gran auge en los comienzos de 1a década

Gel 1970. Tan es asi, que un ex-director de 1a CEA, el Or. Janes R. Schlesinger, manifest6 en el New York Times e1 26 de novienbre de 1976,

Gue 1a CER no seguirfa actuando cono un promotor de la energia nuclear y

Sf se convertirfa en un "éroitro? del interés pablico. Oe hecho, 1a recién creada CRN no tiene funciones promocionales; estas fueron ubicadas en Ta Advinistracién de Estudio y Desarrollo Enérgetico (Energy Research &

Development Administration)

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El desarrollo de Ta energfa nuclear en Puerto Rico en el campo de 1a Generactén eléctrica tuvo un buen comienzo, pero actualmente su estado es incierto en una isla que paradéjicamente depende 100% del petrsteo impor- tado. Por otro lado, en el campo de Ta medicina y en a industria se ha venido utilizando con éxito 1a energfa nuclear; actividad regulada por el Reglamento para el Control de Ya Radiacién en Puerto Rico, promulgado en e1 1972, bajo la supervisién de 10s Departanentos de Salud y del Trabajo ¥y Recursos Humanos. Este reglamento fue establecido a 1a luz de 1a Ley #79 del 24 de junto de 1965, aprobada por nuestra Legislatura, bajo 1a cual

el estado asune control sobre ctertos materiales y equipos radioactivos.

Sin embargo, e1 primer contacto que tuvo 1a CEA con Puerto Rico fue

2 través del Centro Nuctear de Puerto Rico (CNPR).

La Comisién de Energia Atémica fue instrumental en el establecimiento en Puerto Rico de dicho Centro y del primer reactor nuclear para producir

aia eléctrica. Es a través del Comistonado James T. Ramey, un gran amigo de Puerto Rico, y del entonces Director del Centro, Henry J. Gonberg, ue nuestra Isla se viste de largo en el campo nuclear en toda Anérica. Tan es asf, que se hace indispensable que 1a CEA establezca en Puerto Rico una oftcina local (1957 a 1974), dirigiéa prineranente por e1 sefor John

1. Thonas y Tuego por Tos sefores Floyd P. Trent y Perry Morgan. Estos fueron deci ides y entusiastas colaboradores con Tas instituciones que

se vieron envueltas en el desarrollo de 1a energfa nuclear en nuestra Ista,

Centro Nuclear de Puerto

Posterior al discurso del Presidente Eisenhower en las Naciones Unidas

en el 1953, se celebré 10 que se conocié como 1a Conferencia de Panané del

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ao 1956, en donde éste insts especfficanente a que se hiciera algo ?por acelerar 10s usos benéficos de 1a energfa nuclear en todo el hemisferio?

En enero de 1957 se celebré un simposio en 1a Universidad de Puerto Rico sobre las Aplicactones Pactficas de 1a Enerafa Atémica. Durante esta reuncién, 1a necesided de un centro nuclear que sirviese a Latino-

anérica se hizo més evidente.

Gono resultado de este simposio y de la Conferencia de Panand, 1a Comisién de Energfa Aténica de los Estados Unidos estableci6 ef Centro Nuclear de Puerto Rico, contando con Ta importante cooperactén y ayuda de 1a Universidad de Puerto Rico, bajo Tos términos del Contrato #AT=(40-1)-1883 ontre 1a UPR y 1a CEA.

£1 Centro Nuclear fue concedido principalmente como una ayuda 9 1as raciones latfonamerfcanas, a 1as que permitirfa adguirir las técnicas esenciales para as actividades relacionadas con la energie nuclear prove-yéndolas de educacién pare graduados y de oportunidades de Investigacion. Adends, 1 NPR partictp6 en 1a preparacién de operarios y supervisores para el primer reactor nuclear que se construyé en toda: Latinoamérica para generar energia eléctrica, BONUS, Tocalizado en Rinc6n, Puerto Rico.

Fsta era una central nucleoeléctrica de tipo experimental de alrededor de

16,500 kilovatios de energia eléctrica. También ayud6 en las investiga

ciones marinas y anbientales para los malogrados proyectos nucleoeléctricos

de Aguirre y Arecibo.

£1 CHPR fue establectdo el 2 de octubre de 1957 y 1a colocacién de

1a primera piedra para 1a construccién del edificio del reactor, en Mayaguez,

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?tuvo Tuger e1 26 de julio de 1958, el que fue inaugurado e1 23 de agosto

de 1962. Durante su primer afto de operacién (1957-1958) asistieron nueve

estudiantes extranjeros y cincuenta ciudadanos americanos, mayormente

puertorriqueos. (Ver Anejo 2).

Las operactones del CNPR fueron ubicadas en Mayaguez (Recinto Univer-

sitario de Mayaguez), y en Rfo Piedras (Centro Médico). En Mayaguez, eT

Centro ofrecta progranas de tecnologia y ciencias nucleares, ingenterfa, radiofisica sanitaria, quimica, agricultura y biologfa, equivalente al grado de Maestro (Master) en Ciencias. A Ta disposicién de los estudiantes habia tres reactores nucleares, y un montaje subcrftico, un generador de eutrones de 14 MeV, especténetros de neutrones, un laboratorio para trabajos de alta y baja radioactividad, una instalacién de rayos gamma, un laboratorio de quimica y edificios separados para biologfa marina, inge-

nierfa nuclear y agricultura.

En San Juan se contaba con un edificio biomédico localizado en el

Centro Médico equipado para diferentes investigaciones. Facilidades para

radiacién inclufan una unidad de tele-terapia de cobalto 60, una unidad de rayos X para terapia de 300KVP y un irradiador de cobalto. Un laboratori de estado s61ido en el Colegio de Ciencias Naturales de 1a Univer-Sidad de Puerto Rico-Recinto de Rfo Piedras y laboratorio de ecologfe terrestre en varios puntos (Bosque Nacional de Luquillo, entre otros).

Se ofrectan programas en aplicaciones de radio-isétopos, aplicaciones clinicas de radioisétopos, radioterapia y adiestramfento en céncer y radio-

biologta, y posefa una Divisién Médica.

EL GHPR cerré sus operaciones como tal el prinero

Julio de 1976,

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a} convertirse en el Centro de Estudios Energéticos y Anbientales, bajo el mmandato de 1a Ley 93-638 de1 Congreso do los Estados Unidos (1975). du- Fante sus 19 aflos de operacién (1957-1976), ?1 CNPR considera como su prin= cipal Togro el haber entrenado 3,560 estudiantes y cientfficos de 41 dife- rentes pafses en la tecnologia y ciencia nuclear, medicina nuclear y radio- fistea sanitarta, (Ver Anejo 3). De estos, 694 eran extranjeros, 2,866 Cudadanos americanos (1a gran mayorfa puertorriquenos). De hecho el

?nico record que distingue a los puertorriquefios de los denés ciudadanos anericanos disponible a este escritor, nos indicé que entre el 1970

21 1976 de 1,328 ciudadanos americans; 1,248 fueron puertorriquefios.

(Wer Anejo 4)

Otro hecho significante de 1a importancia de este Centro y 10 que epresentaba, fue que en sus primeros 10 afos su staff aumenté de 43 a

300, incluyendo 80 cientfficos. (Ver Anejo 5). AT momento del cierre
Su Senior Staff era de 140. (Ver Anejo 6). Durante sus primeros 18 afios
de vida, el Contro tuvo un pronedio de 185 estudiantes por afo, y en su
timo ato su matricula era de 239 (Ver Anejo 7); stendo e1 1974 su afo
de mayor matrfcula en su historia, 365. Ourante sus Gltimos cinco afos
el Centro adiestré e} 36x de su matricula total de 19 afos. Todo esto
parece apuntar hacia el hecho de que e1 CHPR no habfa perdido importancia

ni interés entre 1a comnidad cientffica a1 momento de su cierre.

£1 Centro produjo en su historia alrededor de 766 publicaciones cien-
tfficas, stendo el afio 1970 el mas productive con 98 (Ver Anejo 8); un
Promedio de 40 por aio. Su staff presenté alrededor de 643 papeles cien-

tificos en reuniones cientfficas alrededor del mundo, stendo el ao més

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Productivo e! 1966 con 76 (Ver Anejo 9); un promedio de 34 por afi. Todo
?este acervo cientifico en el campo de 1a energia nuclear y sus campos re-
Jacionados habla muy bien de Tos Togros del Centro. Ante este cuadro

nadie puede sostener que el interés en la energia nuclear habia deca?do, a1 menos desde e1 punto de vista cientffico.

Por otro lado, eT CNPR tuvo Ya responsabilidad de conductr un pro- ?rane de investigactones cientificas en biologfa, quimica y ffsica cono parte de Ye exhibicién Atonos en Accién ce 1a Conisién de Energia Atémica en Latinoamérica. Estas exhibiciones, que envolvfan seminarfos y confee Tencias, se levaron a cabo desde eT 1965 y a1 19703 siendo beneficiados Jos siguientes paises: ?1 Salvador, Guatemala, Costa Rica, Nicaragua,

Pana, Ecuador, Venezuela, Argentina y Brazil. (Ver Anejo 10).

Sin embargo, el Centro NucTear de Puerto Rico recibié el impacto anti- huclear de 1a década del '70, especialmente durante los afos 1973-76, y el resurgimiento dei movimiento ambiental, Su programa nuclear empez6 2 decaer y gran parte de su presupuesto de adiestramiento y educacién de $1.2 miVTones en e1 1976 era usado principalmente para respaldar Tas ope- Faciones bésicas del Centro (este presupuesto habia sido de $119,000 en 1958), (Ver Anejo 11). Por otro lado, el rol investigative del Centro aunenté de $58,000 en e1 1962 a $1.062 millones en el 1976, especialmente Gedicado a la ecologia terrestre, biologta tropical marina y a la ecologia tropical humana. (Ver Anejo 12). éCumplié con su objetivo el Centro al permitir que 1a ola antinuclear cargara con el programa nuclear a pesar de que tenfa estudiantes y personal? Tan es asf, que el sucesor del CNPR,

@ Centro de Estudios Energéticos y Anbientales (CEA) tiene proyectado

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ara los prdximos § aos (1982-1985) un 0.6% de su presupuesto para un

Prograga nuclear. En el perfoco 1977-1981 menos del 9% fue dedicado a

icho programa. (Ver &nejo 13)

BONUS

El 4 de febrero de 1960 1a Comisign de Enerafa Atémica de los Estados

Usidos de Norteanérica contraté separadanente con 1a General Nuclear Engi-

neering Corporation (GNEC) de Dunedin, Florida, ?.U. y 1a Autoridad de Tas

Fuentes Fluviales (hoy Autoridad de Energfa Eléctrica), para el disefo com

oleto de la Contral NuceToeléctrica BONUS (Boiling Nuclear Superneater).

Se adJudicaron 10s contratos AT(40-1)-2674 y AT(40-1)-2672 de Ta GNEC y Ta

AFF, respectivanente, por 1as porciones nuclear y generacién eléctrica

Estas adjudicactones surgieron com consecuencia de haber completado tanto

12 GEC cono 1a Autoridad de as Fuentes Fluviales (AFF) estudios y disetos

Dreliminares sobre BONUS bajo et Contrato AT(40-1)2484, otorgado en el ato

1958. Dichos estudios fueron terminados e1 30 de noviembre de 1959 y el

21 de diciembre oe ese mismo afi. Fueron publicades en dicienbre de 1959

¥ enero de 1960, respectivamente. La decisién relacionada con el permiso de construceién fue emitido por 1a CEA el 28 de junto de 1960, siendo

Final y firme el 19 de julio de 1960. (Ver Anejo 14)

La Central recibi6 el Permiso de Operacién No. DPRA-4, otorgado por

1a CER, @ principios de 1964. £1 13 de abril de 1968 se Tews el reactor

a un estado de criticalidad inicial, £1 15 de septienbre de 1965 et

reactor fue Nevado 2 su potencia térmica mfxina, 50 megavatios, con todo

1 vapor desviado hacia el condensador. £1 dfa 20 del mismo mes de cargé

19 turbina a 16 megavatios eléctricos, 1a capacidad de disefo de la central.

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Durante el perfodo de? 10 de novienbre a 9 de diciembre de 1965 se operé

Ja central a su potencia completa coma demastracién. £1 perfodo de arran-

que termind el 19 de diciembre del mismo afio. (Ver Anejo 15). Entré en

?operacién comercial en marzo de 1966.

La Central operé hasta julio de 1967, cuando Finalmente fue decomisada

fen el afo 1970 por razones econémicas, segin se sehala mas adelante. £1

proceso de decomisiGn se habia iniciado el 11 de agosto de 1959, al recibir el permso final de 1a CEA, (Ver Anejo 16)

Esta fue Ta primera aventura nuclear de Ta AFF, y el primer reactor nuclear instalado en Latinoanérica para generar energfa eléctricas 0 sea, BONUS fue Ta orinera central nucleoeléctrica de Latinoanerica. ?1 tipo de reactor utitizado era uno de dos que fueran instalados en esa época en fet mundo occidental. Consistié de un reactor nuclear de agua hirviente (toiling water reactor) con sobrecatentador nuclear de vapor integral.

La Gontral tenfa una capacidad generatriz de 16,500 kilovatios eléctricos Era un programa conjunto (Joint venture) de 1a CEA y 1a entonces Autoridad de as Fuentes Fluviates, hoy Autoridad de Energia Eléctrica, sfendo ope ado por esta Gitina en plano de investigactén por espacto de tres afos (1964-1967). Lo que se investigd fue 1a técnica de producir vapor sobre calentado por métodos nucleares, propésito que fue cabalmente cunptido, Una vez denostrada 1a viabilidad de esta técnica, 1a Comisi6n de Enerafa Atéaica desistié de seguir costeando 1a operacién de 1a misma y se Te ofreci6 a la Autoridad. La AFF decidié no operar comerciaimente 1a misma debido a que Ta pequena capacidad de a central (16.5 Me) 1a hacta econé-

rricamente inoperable en su sistena.

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Para ta operacién de dicha central se adiestraron alrededor de 50

técnicos espectal izados ene] campo nuclear en distintas capacidades

(incluyendo ingenieros), 1a gran mayorfa en el Centro Nuclear de Puerto

Rico,

Este proyecto inicié un proceso para dotar a Puerto Rico de una

central nucleo-eléctrica conercialmente vibl.

Proceso que no se ha cul-
wwinado y parece que finalmente decaers. Es bueno sefalar que varios cien=
tf #icos e ingenieros puertorriquefios y norteamericanos (Or. Hodesto Iriarte,
Dr. Juan A. Bonnet, Jr., Ing. Angel J. Lizasoain, Ing. Julio Hernéndez
Fragoso, Sr. James T. Ramey, Or. Henry J. Gonberg, Sr. Sol Luis Descartes ,
Ing. Rafael V. Urrutia, Or. Ismael Almodovar, entre otros), al igual que
Jos ex-gobernadores Luis Mufloz Marin (q.e.p.d.) y Luis A. Ferré, visua-
Vizaron desde el 1960 1a necesidad que tenfa Puerto Rico de independizarse
del petréleo importado (13 afos antes de 1a crisis del 1973), y vieron en
a incalculable energfa atémica 1a solucién de nuestro desarrollo econémico.
la Autoridad de Tas Fuentes Fluviales (hoy Autoridad de Enerafa Eléctrica)
fue pionera, junto al Centro Wuclear de Puerto Rico de ese esfuerzo, Sin

embargo, es bueno sefalar que Ta AEE, por diversas razones, no considera Serfamente al presente Ta alternativa nuclear entre las postbilidades que tiene Puerto Rico para solucionar su dilena energético. Sin enbargo, en San Luts Obispo, California, 1a Pacific Gas & Electric, 1a corporacién brivada mis grande de 1a nacién de generacién eléctrica, esté a punto de ?inaugurar una central nucleoeléctrica (Cafion del Diablo); 1a séptina que entrarfa en operaciones desde el incidente de 1a Isle Three Miles. (Ver

?Anejo 17). Todo esto ocurre en el pats donde més abunda et carbén

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one

fn Susea de un Lugar

Conociendo que Ta Centra BOWS no ofrecta posibilidades de operacién

conercfal, 1a AFF inicié una serie de estudios geolégicos, hidrolégicos

anbientales desde el 1963 alrededor de 1a Isla para buscar posibles lugares,

e ubicacién para centrates nucleoeléctricas y fésiles.

Los primeros estudios (1962-1967) se realizaron en Tortuguero (manatt), Palo Seco (Toa Baja) y Aguirre (Guayama), luego en Punta Higuera (Rinc6n) y Yabucoa. (Ver Anejos 18 y 19).

En una ocasién, entre 1973-1975, 1a AFF 1eg6 a someter 15 postbles

lugares para Ta construccién de centales fésiles a 1a Junta de Calidad An-

biental de Puerto Rico. (Ver Anejo 20). Posteriormente esto se redujo a

cinco (5) por motives ambientales, geolégicos, agricolas, hidrolégicos y

turistico, Luego, de estos fueron establecidos varios para ubicacién de

centrales nucleoeléctricas.

Especificamente, 1a AFF sonetié a 1a Junta de planificacién de Puerto

Rico, el 19 de septiembre de 1963, una consulta de ubicacién para una central

ucleoeléctrica al oeste de Ta Laguna Tortuguero (Barrio Tierras Nuevas Sa-

Vientes) en 1a municipalidad de Manat. Esto se hizo en paralelo con los,

estudios antes mencionados. £1 14 de junio de 1965 se le sonetié a la JP

informacién adicional. E17 de marzo de 1965 se sonetié a la JP los planos

de mensura de las fincas concernidas y se solicit6 permiso para adquisicién

de terreno. £1 11 de octubre de 1966 se le volvié a notificar a la JP que

Ta AFF seguia considerando seriamente los terrenos de Tortuguero para el es-

tablecimiento de una central nuecleoeléctrica. (Ver Anejo 21). Eran los

primeros pasos de un sueflo que hasta ahora parece irrealizable.

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£1 21 de novierbre de 1966 se celebré en Puerto Rico una audiencia

idl ica pare Ta ubscactén de un reactor nuclear de escala comercial para

generar energfa eléctrica. La misma se celebré en el Municipio de Manati.

Se describié el proyecto y se Te 16 énfasis al tépico de seguridad. No hhubo gran oposicién. £1 27 de febrero de 1967 se celebré una segunda audiencia piblica. A 1a miss conparect6 el primer grupo organizado que se oponfa a dicha ubscactén, el cual presents a) sefior Adolph J. Ackerman, de Madison, Wisconsin, como su consultor en asuntos nucleares, Més ade-

ante se descubrié que este sefor era un lego en la materia. (Ver Anejo 22).

A rafa de esa audiencia pablica, el Club Exchange de Manatf enitfo una resoluctén, fechada el 14 de marzo de 1967, resolviendo ofrecer e1 respaldo nanine a1 establecimiento de 1a central nucleceléctrica bajo consideracién. (Ver Anejo 23). Es esta la primera accién concertada de un grupo a favor

e una central mucleoeléctrica de que tenemos conocimiento en Puerto Rico.

Dicha consulta (64-136C) fue recomendada favorablenente el 15 de mayo de 1967 (Informe #67-C-160) por 1a Junta de Planificacién de Puerto Rico. (Ver Anejo 24). La Autoridad adquirié por expropiacién forzosa cerca de 500 cuerdas de terrenos en drea de Tortuguero. Sin enbargo, 1a ubicacién

de dicha central no se viabiliz6, Entre las razones para descartar dicho lugar estuvo 12 posterior centralizacion de industrias pesadas, consumidoras de grandes bloques de energia, a ser local izadas en la Costa Sur y 1a con-veniencia de que 1a generactén eléctrica se ubicara cerca de estos centros. Simul téneanente grupos anbientales continuaron presionando para que el érea de Ta Laguna Tortuguero fuera convertida en santuario ecolégice. Sin enbargo, es bueno sefalar que dicho lugar fue reconendado favorablemente por

el Advisory Committee for Reactor Safeguards (grupo de cientfficos que le

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hhacfan recomendaciones a 1a Comisién de Energfa At6mica), desde el punto

de vista geolégico

41a luz de To anterior, y tentendo conacimiento de ese problena, 1a
AFF ya habfa inictado planes para ubicar un complejo generatriz en el érea
de Aguirre. A tales efectos comparecié a una audiencia publica en agosto
de 1966 en e1 Municipio de Salinas (3 meses antes de 1a que se celebré en
Manat) que celebré 1a Junta de Planificacién (JP) para considerar 1a via-
bilidad en términos generales del establecimiento de una central nucleo
eléctrica. Mis tarde le AFF radicé 1a solicitud #67-1225-P para que se le
sutorizara adquirir tierra y servidunbre de paso para esos propési tos.
Dicha solicitud fue aprobada por ta JP el 24 de mayo de 1967, 9 dfas des-
Pués de haber recomendado favorablemente 1a ubicacién de una central nucleo-
eléctrica en Tortuguero. (Ver Anejo 25). Por Tas razones que sefalarenos
mas adelante, 1a central nucleoeléctrica no se materializ6 tampoco en

Aguirre @ pesar de que el proyecto estuvo muy adeTantado

Mientras tanto Ta Autoridad continué con sus investigaciones geold-

Sicas, hidrolégicas y ambientales alrededor de 1a Isla, con excepcién de

lun area desde e} este del Municipio de Dorado hasta el sector Las Cabezas

en Fajardo, y un area entre Aquirre y Ponce. Estas dos sreas fueron ex-

clufdas, Ta primera por ser una de alto interés turistico y alta densidad

Poblacional, y 1a segunda por ya existir informacién.

En el 1973 1a informacién preliminar disponible apuntaba hacia Ta

Costa Norte entre Tortuguero y Arecibo cono Ta de mayor potencialidad.

(Ver Anejo 26). Entre los sectores estudiados se encontraban Punta Cerro

Gordo (Dorado), Rfo Cibuco (Vega Baja), Punta Chivato (Manat), Tortuguero

(Nanatf), Islote (Arecibo), e1 area de Quebradillas, Quebrada del Toro

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(Isabela), Cabo Mala Pascua (Patillas), Punta Verraco (Guénica), Morilos

(Cabo Rojo), Rincon y Aguadiita.

Finalmente se reconendaron tres sectores: Tortuguero (el que habfa

$1do aprobado en 1967), Islote y Punta Chivato. Ya en estos monentos

?1 factor principal era ecolégico y geolégico. Islote fue selecetonade

Y fue recomendado por 1a Comisién Reguladora Nuclear desde e1 punto de vista ambiental (stendo de hecho el Gnico lugar asf aprobado en P.R.) en 1976, (Ver Anejo 27). Segin seRalorenos més adelante, Islote probé ser 1a aparente tunba de! desarroilo de Ta energfa nuclear para generar elece tricidad conercialmente en Puerto Rico. De hecho, esta unfdad (0 unidades) nuclear experinent6 una serie de posposiciones por diferentes razones, hasta ue se cpospuso? indefinidamente, 1976, 1981 y 1985; entre las razones Podriamos mencionar problemas de financiamiento, aumento de costos y consi-

deraciones politicas.

Aguirre e Islote: iFracasos 0 victinas?

Aguirre, un poblado rural del Municipio de Salinas, dentro del Distrito de Guayana, (espectficanente el Barrio Jobos) tuvo Ta primera oportunidad seria de convertirse en uno de 10s primeros lugares en Latinoanérica en ?tener una central nucteoeléctrica de una capacidad intermedia (500 MWe) de tipo comercial para el 1976,

Pensando en grande, en e1 1968 1a Asanblea Legislatura de Puerto Rico asign6 $200,000.00 pat

Ser pareados por la CEA para Tevar 2 cabo un

estudio conducente a1 establecimiento de un centro agro-industrial de

energfa (Agro-Industrial Nuclear Energy Complex), que también se conocté

?como NUPLEK (Nuclear Complex). (Ver Anejo 28). £1 misno estaba formado

---Page Break---

bor 22 estructuras principales y sus instalacion

+ plantas desalinizadoras

(para tratar de resolver parcialmente el problema de las sequfas en Ta

Regién Sur), plantas para recobrar sal, refinerfas, plantas quimicas saté

Nites, planta de aluminio, finca agrfcola experimental, aeropuerto para

aviones Tivianos y un Srea para una futura expansién industrial. Oicho

estudio no cont6 con Tos aumentos descomnales en el precio del petréleo

Gue comenzaron en el ato 1969 e hicieron crisis en 1973. Habiéndose con-

Eluido eI estudio en 1969, estos acontecimientos invalidaronde facto el

mismo. Adenés, fue precisamente en el avo 1969 que se comenz6 el movi-

siento anbientalista en los Estados Unidos y Puerto Rico, con 1a aprobacién

481 National Environmental Policy Act (NEPA). Com consecuencia de este

movimiento, Ta Bahfa de Jobos (Aguirre), en donde se habia reconendado establecer NUPLEX, fue posterformente declarade un Grea ecologfcamente

delicada. £1 tipo de reactor nuclear que se planeaba construir eva el de

agua presurizade (PWR).

Por otro lado, e1 26 de junio de 1968 un Comité Especial nonbrado

or el Director Ejecutivo Interino de 1a AFF para Vevar a cabo una eva

luaeién econdnice sobe Ta decistén entre unidades f6s?Tes 0 unidades

nucleares rinde un informe titulado Comité Especial sobre 1a Selecctén

4d Unidades Generatrices para el 1975 y 1976. Dicho Comité reconend6 en

?icfenbre de 1968 21 Director Ejecutivo Interino 1a construccién de una

Unidad £6541 para operacién en 1976, (Ver Anejo 29).

En enero de 1969 en una reunién en La Fortaleza, mansién ejecutiva

de Puerto Rico, entre el recientemente electo gobernador ingeniero Luis

A. Ferré, el Director Ejecutivo de 1a Autoridad ingeniero Félix Cordova

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Diaz, el Sr. Janes T. Raney, Comisionade de Ta CEA, y el Dr. Modesto Iriarte,

de Ya Autoridad, y otros, e1 entonces gobernador de Puerto Rico, ingeniero

Luis A. Ferré, 616 autorizacién al Director Ejecutive de 1a AFF para que procediera s considerar serianente Ta alternativa nuclear. Al seftor Gobernador Te preocupaba la total dependencia en e? petréleo, especialmente ante lo que se empezaba a percibir en el mercado de éste.

Este nuevo enfogue ante Tas alzas aceleradas en el costo del petréleo, que no Se consideraron en los estudios anteriores, i6 una gran ventaja 3 Ja alternative nuclear en los estudios de planificactén. £1 endoso decidido del entonces Gobernador Ferré fue instrumental para considerar positivamente 1a instalacién de una central nucleoeléctrica que entrarfa en oper

cin comercial para enero de 1976. Ya para esta fecha la Autoridad habia planificado 1a construccién de dos unidades fésiles, utilizando petréleo, de 460 we cade una en Aquirre. Este lugar fue seleccionado debido a 1a actividad industrial que se esperaba se desarrollarta en el rea, actividad ave 1ueg se quedé muy corta. Posteriomente se afadieron dos unidades de gas (1972) de 40 We y Finalmente dos unidades de ciclo conbinado de 250 the cada una, La Declaractén de Impacto Anblentat para el desarrolto de Aguirre fue sonetido 2 Ta Junta de Calidad Ambiental el 21 de abril de awe.

Para abaratar los costos de construcetén de a futura central nucleoeléctrica 1a Autoridad decidi6 ubicarla en Aguirre donde existirfa Te infra-

estructura necesaria, tales com centro de transmisién, Iineas eléctricas,

carreteras, almacenes y otros. Se confié en el juicio de Tos entonces

consultores de 1a AFF en materia geolégica y sfsmica, quienes asumieron que

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Ja falla geolégica en Aguirre podia probarse que era inactiva. Ast se

abandoné el lugar del grea de Tortuguero, adenés de por las razones ya

expresadas.

Esto luego resulté ser un gran error y quizés el punto que marcé deci-

Gidamente Ta final cancelacién del proyecto nuclear. De haberse seleccio-

?nado e} rea de Tortuguero creenos que el proyecto se hubjera Nevado a

feliz término. Esta habfa sido la intencién originada

Ya e119 de julio de 1972, 1a CER conenz6 a poner reparos en Ta data

geolégica presentada. Segin elTos 1a misma no probaba que una fala geo

Tégica cerca de! Tugar de Ta ubicacién de reactor estaba inactiva, y que

robar dicha tnactividad era sumanente diffcil. (Inactive querfa decir

que 1a falla no habia sufrido ningin desplazamiento durante los 61tinos

35,000 ahos y no mas de un desplazaniento en los Gltimos 500,000 afos).

Este problema tenfa una solucién ingenieril: disetos para terrenotos de

magnitudes elevadas. Pero el costo envuelto era my alto. Por tal razény desde e1 10 de enero de 1973 se comenz6 a hablar sobre 1a necesidad de mover 1a5 unidades nucleares @ otros lugares. Para agosto de 1972 1a Autoridad se vi6 forzada a paralizar indefinidanente Ya construceién de

dicha unidad debido a este problema. Se volvié a sugerir la utilizacién

del lugar disponible en Tortuguero, aGn cuando habia que conenzar de nuevo todo el proceso de aprobacién del lugar. Este canbio trajo 1a posposicién

de 1a unidad nuclear de 1976 a 1981.

Los estudios que se habfan venido realizando indicaban una posible

faja de terreno apropiado para 1a ubicacién de unidades nucleares entre

el este de Arecibo y eT oeste de Tortuguero, a pesar de que mapas geols-

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Gicos indicaban Ta posibilidad de 1a existencia de una falla menor conoida como Briggs Fault a 10 largo del Cato Tiburones.

£1 25 de junio de 1973, 1a Autoridad decidié concentrar sus esfuerzos ¥ estudios geolégicos en Tortuguero e IsTote (Arecibo). Finalmente,

Jos estudios geolégicos, anbientates y econdmicos determinaran que el lugar mds apropiado desde el punto geos{smico era cualquier punto en Ta Costa Norte Tocalizado entre Arecibo y Dorado. Se seleccioné el grea de Islote del Municipio de Arecibo como 1a mis apropiada, incluyendo e1 as- ecto ambiental y social. Este lugar satisfacta los eriterfos de se- leccién de lugares (site selection) tanto de 12 nueva Comisién Regula- Gora Nuclear (CR), como de Ta vieja Comision de Energia Atémica. Los hellazgos de este estudio fueron discutidos con el personal del CEA. Posteriormente 12 Autoridad radicé ante 1a nueva CRN el Informe Preli- minar de Anélisis de Seguridad y e1 Informe Anbiental el 26 de septienbre de 1974; los mismos fueron aceptados oficialmente por 1a CRN el 27 de enero de 1975. Estos documentos son los que conducen esenciatmente al

permiso de construccién.

?Como consecuencia de! enbargo petrolero del 1973, las realidades econdmicas y financieras por las que atravesaba 1a Autoridad y la crisis recesionarta que afectaba a Puerto Rico en el 1975, en adicién a la reduccién en 1a demanda de energia (de 16.2% en el afo fiscal 1972-1973 a-1.7% en el afo Fiscal 1974-1975), y los estimados de proyecciones de demanda eléctrica, hicieron posponer la posible construccién de 1a unidad nuclear en 1a Isla del 1981 a1 1985,

Por tal razén, e1 10 de agosto de 1978 se decidi6 no continuar con

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aquella parte del proceso de 1icencianiento que envolvfa las vistas pi-
bIicas sobre asuntos anbientales y 1a conparecencia ante el Advisory
Committee for Reactor Safeguards en relacién al Informe de Evaluacién
de Seguridad. St se decidié continuar con los esfuerzos para que Ta CR
aorobaré Finalmente a Islote cono un lugar apropiado para untdades nu-

cleares de cierto tipo y capacidad en todos sus aspectos.

Ya en septienbre de 1975 Ta CRU Te habfa dado el visto bueno a Tas
rnedidas de seguridad de 1a propuesta central nucleoeléctrica. Mis ade-
ante, el 11 de septienbre de 1976, Ta CRU determing en el Borrador de
Declaractén de Inpacto Ambiental que el propuesto Barrio Islote era apro-
Biado para el establecimiento de una centrai de energfa nuclear, desde

este punto. (Ver Anejo 30).

Por otro lado, a principios del aflo 1976, y debido a las posposicién

de 1976 a 1985, 1a Autoridad decidi6 vender todo el equipo de 1a central

rucleoeléctrica. No se pudo vender y ests almacenado en Aguirre.

Eventuatmente 1a construcci6n de 1a central fue pospuesta indefi-

nnidanente, el equipo almacenado en Aguirre y obsolete, y los Ifderes

politicos de todos los partidos en contra de la construccién de dicha

central en el futuro previsibl

(Wer Anejo 31). La unica excepcién

Siempre lo ha sido el ex-Gobernador Luis A. Ferré, quien es ingeniero

ecénico, y anteriormente e1 ex-Gobernador Luis Mufoz Marin (q.e.p.d-)+

quie 416 instrucciones al Sr. Sol Luts Descartes, ex-Director Ejecutivo

de la AFF, para iniciar el programa nuclear en 1a AFF (hoy Autoridad de

Energia Eléctrica). £1 ex-Gobernador Roberto Sénchez Vilella, quien tan

bign es ingeniero civil no se ha manifestado ultinamente. Pero tanto bajo

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Su presidencia en la Junta de Gobierno de 1a AFF como en su término en Ta Gobernacién (1966-1968) et prograna nuclear de la Autoridad se desarrol16. Tanto e1 Gobernador Carlos Romero Barcelé, cono el ex-Gobernador Rafael Hernéndez Cotén y Tos Ifderes independentistas Rubén Berrios y Juan Mari Bras, que son abogados, se han manifestado en contra de Ta energia nuclear. Todo, a pesar que los asesores cientificos © ingenteros de Tas dltinas 405 adninistraciones 1972-1960 han respaldado Ta energfa nuclear. Todo ?1 proceso de Ticencianiento fue detenido en 1979.

Es bueno sefalar que 1a organtzacién privada Misién Industrial, Inc. Views el peso principal de 1a opostcién nuclear, tanto en el Proyecto de Aguirre como e1 de Islote. Su intervencién fue efectiva y su voz fue escuchada con detenimiento y sus argunentos considerados con mucho

cul dado.

Por otro lado, tanto el Colegio de Ingenieros y Agrinensores y el Colegio de Quinicos de Puerto Rico han respaldado consistentenente 1a opcién nuclear. Lo misno hizo el National Acadeny of Sciences en su ?informe Energy in Puerto Rico's Future, publicado en forma final en 1980; ain cuando considera que por razones de capacidad del sistema eléctrico 4 18 demanda pronosticada, una central nucleoeléctrica no es viable, por To menos durante 0s préximos 20 afos, a menos que se desarrolle una Unidad nuclear pequetla que sea econéaicanente viable. Similar posicién hhan tonado 1a mayor parte de los ex-directores ejecutivos de 1a Autoridad de Enerofa Eléctrica.

Esta posicién contrasta con el hecho innegable que 1a Autoridad
tiene en operacién dos unidades de 460 Mie cada una y dos unidades de

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-a-

425 MMe cada una, para las cuales se tienen que proveer las correspon-
dientes medidas de reserva y estabilidad dindmica, a menos que 12 Auto-

ridad decida descartarlas en el futuro lo cual resulta ilégico.

Gentro de Estudios Energéticos y Anbientales de Puerto Rico

Como sefalamos a1 comienzo de este escrito, el Centro de Estudios
Energéticos y Anbientales de Puerto Rico (CEA) es el sucesor del Centro
Nuclear de Puerto Rico. Inicié operaciones al Iro. de julio de 1976 y
Surge con el cambio de prioridades ocurrido con 1a Ley 93-438 que creé

Ja Adninistracién de Estudios y Desarrollos Energéticos (ERDA) en e¥ 1975.
Se reorientan los programas para hacerle frente a la crisis energética,
especialmente en relacién con el impacto ambiental resultante de tecno-
logias energéticas y usos energéticos. Ademés, se reorientan Tas inves-

tigactones hacia el uso directo de la energfa solar e indirectanente por

medio de 1a conversacién oceano-termal.

[1 CEEA se dirige principatnente a las cfencias anbientales; meci-
ina, conservactén de energfa; ciencia o ingenierta solar, incluyendo
conversi6n oceano-termal; y desarrollo e investigacién de materiales.
Tarbién estudia otras fuentes de energia; bionasa y bioconverstén. La

energfa nuclear ha sido totalmente relegada.

En el "Integrated Program Plan for UPR/CEER FY 1977-82" que fue
Preparado en abril de 1977 y corregido posteriormente (CEER-A-63) en el
1980, nos dice que dicho Centro esta comprendido de cinco divisiones
principales: a) Solar; b) OTEC; c) Ecologia Marina; d) Ecologfa Terres-
tres ye) Biomasa. £1 presupuesto sugerido para ese programa de cinco

afos elimina totalmente en 1979 los Programa de Medicina Nuclear e

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Ingenierfa Nuclear. (Ver Anejo 32)

Por otro lado, en el propuesto Plan de Cinco Aas (1982-1986), e? Centro incluy6 un programa nuclear, pero sélo Te asigna el 0.6% del pre- Supuesto total para esos cinco afos; y el mismo va mayormente dirigide

@ Ia fusién nuclear (92t). (Ver Anejo 13). Solo el 6% del presupuesto se astgna a educacién y adiestramiento. Con este cuadro Ta energia nuclear parece destinada a desaparecer det panorama puertorriquefo, espe- cialmente en el campo de 1a energfa eléctrica. Parece extrafo que siendo Ja energia nuclear una fuente de energia disponible se haya relegado al

plano que se encuentra hoy dfa

En los infornes anuales del CEEA (1979-1980) nada encontraros sobre energia nuclear. Sin embargo, el Informe Anual de 1980 (p. 29) hace wrencién de un estudio realizado sobre las necesidades energéticas de Puerto Rico hasta el afio 2020 y el costo de las diferentes alternativas, 1 cual podemos apreciar concluye graficavente que la alternativa nuclear es la més econémica. (Ver Anejo 32). Pero el informe solo destaca el hecho que 1a biomasa constituye una solucién a corto plazo y OTEC para

Ja préxina década, @ pesar de que este Gitimo se equipara con la nuclear fen el afo 2020.

Por otro lado, el Centro continda su proliferacién de publicaciones cientfficas (ninguna nuctear) con 34 en 1979 y 53 en 1981. Pero algo sf tenemos claro, que el Centro tiene la capacidad cientffica para envolverse nds en el carpo nuclear.

Status Actual de 1a Energia Nuclear

Aunque parezca paradéjico, desde el enbargo petrolero del 1973 Ta

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energfa nuclear para generar electricidad comenz6 a decaer tanto en los

Estados Unidos cono en Puerto Rico. Lo contrario ocurrié en Europa y

Jap6n, y en algunos paises latinoanericanos. Lo legislacién anbiental,

Ja inflacién y reces én causada por e problena petrolero y 1a dismi-

riuctn en e1 consuno de electricidad fueron factores para esta declina~

ign en e1 interés en centrales nucleoeléctricas.

Actuatmente hay cuatro (4) veces més unidades nucteares planifi-

cadas 0 bajo construccién fuera de los E.U.

- que en este pafs (Business

Week: agosto 31, 1961; p. 102). (Ver Anejo 33). Por otro lado, en los Estados Unidos se han cancelado 0 centrales nucleoeléctricas desde el 1975, 16 en 1980 (Business Week, supra). Este hecho, junto al hecho de que Tas exportaciones de la industria nuclear han disminuido de 83

(1958-1975) 9 27 (1975-1981), tienen al borde de 1a muerte a esta industria.

£1 Gobierno Federal canbi6 su enfoque en el prograna energético a transformar 1a CEA en 1a Adninistractén de Estudios e Investigaciones Energéticos en el 1975. Mis adelante, el Presidente de Tos Estados Unidos, Linmy Carter, se dectaré en contra del establecimiento de nuevas untdades nucleares. Pero aparentenente et Presidente Ronald Reagan, de los Estados

Unidos, tiene intenciones de revivir al programa nuclear

Como sefialéranos anteriormente, en Puerto Rico le energfa nuclear y Su uso para generar electricidad parece estar merta. Durante los Gltinos anos, 1a AEE (antes AFF) ha venido reatizando esty

y gestiones para

construir para e7 1990 una unidad de 400 te que quene carbén. La unidad nuclear ni tan siguiera fue considerada. £1 pasado 2 de septienbre de

1981, e1 Gobernador de Puerto Rico, Carlos Romero Barcel6, anuncié que

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se habfa descartado Ta construccién de atcha planta de carbon, aunque se

Planes convertir unidades que quenan petréleo para que quemen carbén

Dicho proyecto recibi6 el endoso del Director de Ta Oficina e Enerata y

del presidente det Coleaio de tngenieros y Agrinensores, rechazando anos

Ja alternativa nuclear. (Ver Anejo 34). Sin enbargo, es bueno recordar

?que ?1 CIAPR en e1 1975 di6 un endoso, por Resolucién de su Asanblea

General, a 1a energfa nuclear como resultado de un estudio realizado por

ingenteros pertenecientes a dicho Colegio. (Ver Anejo 35).

Por otro lado, desde e1 1976 los Ifderes de los principales partidos

polsticos del pats, han rechazado consistentenente Ta utilizacién de Ta

eneraia nuclear como fuente de enerafa eléctrica. (Ver Anejo 31). Tan

reciente como e1 9 de junio de 1981, e1 pasado Gobernador descart6 1a

energia nuclear ?por considerar que no existen adecuadas garantias anbien-

teles*. (Ver Anejo 36). Todo esto, a pesar que 1a CRN dijo Io contrario

?en 1976, (Ver Anejo 30). Anterformente, ene] 1978, el actual gobernador

hhabfa expresado su rechazo ?por el problena de disposicién (de residuos radioactivos)", (Ver Anejo 31). Todo esto a pesar que en Puerto Rico no

Se va a disponer de esos residuos. En el 1977 habfa manifestado que no se

debia descartar totalmente y que se oponta ?ya que los vientos de mar a

?erra podrfan contaninar e1 campo en caso de producirse un escape". (Ver

?Anejo 31).

Por otro lado, otro ex-gobernador (y el nico ingeniero entre os

gobernadores que han opinado) se ha manifestado consistentenente a favor

de Ya energfa nuclear, a1 igual que 1a comunidad cientffica en general.

(Ver Anejo 31).

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Segin 1a informacién ofrecida por el Director Ejecutivo de ta AEE y

1 Gobernador a1 descartar 1a planta de carbén, 1as prayecciones de denanda

e enerofa indican que 18 cepacidad actual de 1a AEE es suficiente para

satisfacer Te demands hasta e1 1995. Este hecho y 1a oposicién en el

Viderato port

ico del pafs hace renotamente posible el establecimiento de

una unidad nuclear en Puerto Rico durante el resto del presente siglo. No

Se he considerado la posibilidad de sustituir las unidades convencionales

?que ya han pa:

do 0 pasarén su vida til por unidades nucleares para econo-
mizar a largo plazo Tos gastos de conbustible. Sin enbargo, sf se piensa

hhacer con unidades de carbén.

Esperanos que el sinposio sobre energia nuclear que se celebraré

en Puerto Rico durante el mes de novienbre de 1981 tratga mayor luz sobre

este asunto.

A No largo de este escrito nos hetos podido percatar que 1a proble-
mnitica de 1a energfa nuclear en Puerto Rico nos presenta estas dos ver-
tientes: politica y tecnologfa. Los aspectos técnicos tienen soluciones
?SEenicas. Ye en dos ocasiones 12 Conisién de Enerafa Atomica y 1a Comisién
Requiadora Nuclear han aprobado pretiminarnente, desde el punto de vista
anbiental, tres lugares en Puerto Rico (Tortuguero, Aguirre e Islote)

£1 problema sfsmico es uno de diseio y econdmico. Por eienplo, en California, un érea de alta intensidad sfsmica, se han establecido centrates

hucleoeléctricas. La Gitina tan rectente como septienbre de 1981, 1a

Central Nuclear Cafon del Diable, en San Luis Obispo. De hecho, durante

un fuerte movimiento telGrico en anos recientes, fue una central nucleo-

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eléctrica Ta dnica que se mantuvo operando en un sector de California.

Can del Diablo es 1a séptina central nucleoeléctrica que inicia opera

clones desde el incidente de

1¢ Miles Island.

1 problema de 1a disposicién de desperdicios radioactivos no debe

constituir preocupacién para Puerto Rico. Estos desperdicios se atmacenan

fem lugares escogidos en Tos Estados Unidos. Adenés, se sigue estudiando

© ?nvestigando nuevos métodos de disposicién. Por otro lado, en octubre

de 1977 el Presidente Carter, de los £.

anunci6 que el Gobierno Federal

almacenarfa los combustibles usados de centrales nucleoe éctrices coner-
ciales por una tasa de almacenaje sencilla, pars Viterar 1a presién que
tienen las Centrales por carecer de espacio sufficiente mientras continda

Va investigacién,

El aspecto de seguridad y ambiental ha sido soluctonado en més de

luna ocasién. En cuanto a esto, el incidente de Three Miles

muchos puntos positives.

Sin embargo, 10s polfticos siguen trayendo argunentos que ya 1a
tecnologia ha resuelto o que ni tan siguiera atafien a Puerto Rico, 0 que

ya fueron evaluados por 1as agencias concernida:

Por ditimo, es bueno sefalar que existe un aspecto sumanente inpor-
tante en el caso de Puerto Rico: el econénico. Una decisién nuclear en
?nuestra Ista més que tomar en consideractén asuntos técnicos 0 polfticos,

tHene que tonar en consideracién el impacto econénico. Este resume toda

nuestra problesdtica. Si consideranos que los atrasos de los proyectos

de Aguirre e Islote hicieron que los mismos Megaran a niveles de costo

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Prohibitivos y que Te posposicién de los mismos le ha costado al pueblo

de Puerto Rico cerca de $100 millones anuales, tenenos que conluir forzo-

Samente que el aspecto econdmico tiene suna importancia en nuestra Isla.

?los preguntanos si Ta solucién a toda esta problenstica poli tico-

econémico-tecnolégica seria consultar a nuestro pueblo directanente, des~

Pués de una orientacién de tos pro y los contras? tuchos estados de los

Estados Unidos y pafses europeos han recurrido a este mecanismo pore

?auscultar el verdadero sentir de los realmente afectados: 10s consumidores.

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fnejo 2

IK

World List of Nuclear Power Plants

Operable, Under Construction, or on Order (30 MWe

1d Over) as of June 30, 1981

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?Twice each year Nuclear News sends a questionnavre to each vilty or agency on this list. asking for

corrections or additions tothe information listed. In cases where a response 1s ot received. we do

fotiow up by phone. though such follow-up snot always possibie for plants outside the United States.

?The criterion for Histing a unit 1s that either an order ora letter af intent has been signed for the

?reactor. In cases where the definition of ?etter of intent? may be ambiguous. or where a spec

situation may exist the judgment othe utility 1 followed as to whether a plant should be included in

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World List of Nuclear on Gamer

Power Plants, cont'd ee

cox Gamer ate spe se tre

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Table 4: PRNC Students by Country ? FY 1958-FY 1976"

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Table 3: Geographical Distribution of PRNC Students, FY 1970 through FY 1976.

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INTRODUCTION

?The Puerto Rico Nuclear Center, Founded in 1997, ss operated under cv

yr the J. 5. Atonie taergy Conmizeion by the University of Puerto Rico, whose

Seosent soay of 34,000(which fas doubled ta each of the past three decaies)

fakes st spe Selari"s largest university.

?Yor Naclear Conver engages in training and research in the peaceful use of

nuclear smeray, with special eaphasie pon the needs of Muerto Rico and Latin, deerica, fhe idea for a nuclear center on thie Caribbean island steme? rom Preslinnt Dvight D. Eisenhower's historic "Atone for Pease? aldress before the Salted Kations Gerors! Assembly in 1953.

ce 1987, ?he Maclean Canter tas grown rapidly, Ite ftest year staff of 1G hag saltipiitd to toariy 300, including 80 scleatiets. PRND's etuient enroll~ ent saat year vas 236, Tour tives the anount curing its Cirst year. About one~ Tittn cr ste dyh1s alainl are foreign cational, from 18 Latin Aeerican republics ae well aa other ations.

?Tue Contor {2 soatt conpared to anjer muclear labs on the U. §. sainland, but its souern facilities are excellent

One of PRI's two main facklities ie at the University's Mayagues campus

fon the west coast. Muerey St has three reactors(one pool-type research reactor

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neutron specurossters, a laboratory for work with high~ and low-level railo~

Muivity, a large gunn facility, w chemistry laboratory, and. separate bulidings

for plant esences) nuclear engineering and zarine piology. The aurine biology

proeren sas a 100-ton oeeanographie research veasel, fully equipped with Aabere-

?he other main facility ts at the new Medical center in Rfo Piedras, on the

ousaxiree of San Juan, The Bio-Medical building in Rio Piedras 1s equippea for

Fesearch in several fields. Irradiation factiities include a eobalt-60 tele-

herepy unit, «400 KVP Xeray therapy unit, and a cobeit-60 irradiator. An

faninal aouse ext door ie stocked with colonies of sice and snails for experi

Cental uae, A solid state physice laboratory ss located at the University's

College of Natural Sefences in Rfo Piedras; terrestrial ecology laboratorie

fare located in the Loqutllo Rational Forest.

?The Nuclear Center's academic progran is closely integrated vith the master ?ogres prograns of the UPR in the plysical ant life sciences, agriculture ant lengineering. Students ensoll at the University and receive acadenic credit Uhrough the corresponding University departaen:. Their professors are scientists who ave gotnt eppointarsts at both FRAC and the University. Inroais are also Deing made at the doctoral Lavel. ?ev doctoral prograss are nov offered in Mochenistry, slerebiology and physiology; proposals for prograce in physical Selences and? cheaistry are under stauty.

PRNC also gives non-credit training courses, It provides facilities for

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Table 4: PRNC Students by Country ~ FY 1958-FY 1976

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SCIENTIFIC PAPERS PRESENTED BY PRNC STAFF

AT SCLENTHE!

MEETINGS

FY 1958 FY 1968,

1959 1969,

1960 1970

1361 197

1962 1972

1363 1973

1964 1974

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1965, 1975

1966 1975,

28 #48

1967 1976

* 2 Oct. 1957 a 30 junio 1958

© 1 julio 1973 9 30 junio 1975 (panc-198)

?et 1 julio 1975 a 30 sept. 1976 (ceeR-as)

Fuentes de Informacién: PRNC 22, 47, 82, 102, 121, 131, tho, 14h, 157, 165,

176 y 198; ceER-As.

Nor

PRNC 22 cubre el perfodo de 2 oct. 1957 a 30 de junio 1963.

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SCIENTIFIC PUBLICATIONS BY PANG STAFE

FSB wee Fv 1968

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1967 1976 ee

* 2 oct. 1957 a 30 junio 1958

1 julio 1973 9 30 junio 1975 (PRNC=198)

Set 1 julio 1975 9 30 sept. 1976 (CEER-AS)

Fuentes de Informacién: PRNC 22, 47, 82, 102, 121, 131, 140, 144, 157, 165,

176 y 198; y CEER- AS.

Nota: PRNC 22 cubre periodo de 2 oct. 1957 9 30 de junio 1973.

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ane 16

"The PRNC has been assigned the responsabilty for conducting @

program of scientific investigations in biology, chesmistry, and physics

15 part of the United States Atonic Eneray Conmission Atoms For Peace

Exhibit in Latin Anerica. During 1965 the Exhibit was taken to El Sal-

vador and Guatemala under the auspices of the USAEC Division of Special

Projects." PRNC-82

1965 £1 Salvador -

Guatemala PaweB2

1966 Costa Rica ~ paNc-102

Nicaragua

1967 Panané ~ pANC-121

Eeuador

1968 Venezuela prwe-131

Argentina

1969 = PANC-140

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Anejos 11 y 2

vireo stares.

ENERGY RESEARCH ANO DEVELOPMENT ADMINISTRATION

April 11, 1976

ACTION YEYORANDUM 6108

Adziniatrator

Assistant Aduinistrator for Pield Operations

[ROQUEST FOR AFPROVAL OF A CHANCE IN THE ARRANCHONT WITH THE

UNIVERSITY OF PUERTO RICO (UPR) FOR MANAGHOGNT OF THE PUERTO

?RICO NUCLEAR CENTER (PHNC)

Issue

To determine the programmatic and institucional future of the Puerto

Rico Wuclear Center facilities and recomend, if necessary, changes to assure that the FRNC's future mmnagenent end operation ara consistent

wich ERDA's programatic requirenents.

vernon

4m FRDA Task Force van appointed by the AFO at the request of the ALA ?and AES co address the issue. A counterpart Puerto Eican Task Porce vas appointed by the Presidest, OE, to coplenent the EEDA Task Force effort (Enclosure 1).

BACKGROUND

Funding,

The PREC vas established in 1958, under the Atons-for-Peace program, to Siigess atelees scutes fa rape ecto sod cenoogy ee

Sag sestrinca the aod edecneion ro

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ec saed Peacipelly for bande. operoting eure of the ComRae~

?Finding of Uiis Wctivicy ia expected? to decrease to feflect the decreasing nucles® training needa at PIMC. SPISC'S eevearch Tale Eas gieses| mainly with fondo fron AES (81.002 willion in FY 76) and sound expertice

ESAS Mile Couey AS separ: oP tue caeiae Blotogye eee

fropieal fuuaa ecologyd AES support for ihe an oe teceeaeriad

Slology nd Wasas ecology programm ia expected to continue and wey

GSeeease siggneiy co pick op overhead conte previously carcied in other proprans.? Eesearch ia muclear sedicioe and agriculture 12 ot « high

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PROGRAM COST SUNMARY

PUERTO AICO NUCLEAR CENT ER

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?PROPOSED FIVE YEAR (1982-86) PLAN

SumARY

?The proposed five year plan (1962-86) for the development of alternative energy sources ia subdivided into thirteen (13) mai

subject areas:

1. ore

11, Biomass

TIT, Bioconversion

IV, Fossil Fuels Research

V, Solar Program

VI. Ecology Programs

VIL, Enviromental Health

VIII, Materials Developsent

IX, Integrated Technological Assessment

X, Nuclear Program

XL, ?Transportation and Conservation

XIT, Public Avarene:

XIII, International Programs

Sumary Table S-1 "Total Funding Requiremente for Proposed Five

Year Plan" iLlustrates the funding level requirements for each sub-

Ject program. Total funding requirements average out approximately 91347

million per yearsThie is approximately 3-4 times the average level of

CEER funding existing during the last tvo or three years. One of the

Freon CEER- 4-55

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fain reasons of the incr: fe reflects

is that the proposed program bud

costlier development and denonstration programs as compared with previous

less expensive programs addressed to develop baseline information data.

42% of the total budget goes tovard "Development and only 30% to Ba

Research, This last requirenent is

\dly needed for developaent of addi-

tional baseline information, Demonstration prograns account for 22% of the

Budget while training and education accounts for less than 62, No meaning-

full energy proses

could be developed vithout « funding conparable to the

indicated in Sumary Table S-1. OTEC is the largest budgeted program (21.52) followed by Biomass (19.42). Beology which interfaces vith several of the energy programs ranks third in budgeting (18,62) followed by Solar (9.12).

Sumary Table S-2 "Total Program Fersonnel Distribution? illustrates

the total manpover requirements, by classifications for all prograss. For

?ail information on sanpover requirements, per program see the corres-ponding Table 2 under the respective program section.

?The total saximu pi

jected personael requirenents for the progras varies

yetween 297-335, Present CEER total

?sonnel is slightly under 200,

hence this indicat

?an approximate grovth of 77% to handle all programs.

EER feels that enough physical facilic:

face available, After deconta-

?ination of the nuclear reactor facilities in Mayaguez, that additional

&

Favaitabie opace in addition to that available at the Rio Piedras facility should be able to accomodate the projected expansion.

F

Sumary Table $-3 "Total Program Budget Distribution by Type of

Research, Developaent, Demonstration and Education and Training. The

?laraese component a8 previously pointed out is "Developeent?. For details

{at Padeer classitication of « particular progran refer to the corres.

Douding Table 3 in the respective section program.

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X. NUCLEAR PROGRAY

AL Nuclear Fusion Progras

Nuclear fusion promises to be the ultimate and optimin solu-

tion of the energy problen for husanity. The first nuclear fusion

reactors will use tritium fuel. Approximately 85% of the energy in

this type of reaction is Liberated in the fora of MEV neutrons. Any

machine designed to harness the energy produced by this type of reac~

tion must convert the I4MEV neutronic energy into a manageable form.

?The most commonly considered concept to harness the 14MEV

?neutron energy in fusion reactors is by permitting the energy

to be deposited in a ithiun blanket designed to breed the re~

quired tritium 107 and the heat generated in the blanket is

rencved by conventional heat exchanger technology to operate

fa rarkine cycie. This approach does not Lend itself to the

generation of out reactor fuels.

ydrogen production from vater decomposition with L4MEV neutrons

is of particular interest in the harnessing of this fusion energy for

the generation of out reactors fuels, CEER has at it

facilicies in

Mayaguez a 1SOKEV proton accelerator and facility vhich produces LAMEV

neutrons in a target reaction which could be effectively used for this

purpose

Existing experimental data on the conversion efficiencies of

radiolytic water decomposition indicate values of 10%. Sone

experimental data indicate higher efficiencies (30 to 402), but

results are not, fully understood and the researchers have

---Page Break---

x2

not been able to duplicate experimental results such as the CIRENE reactor experiments. More inportant, however, there

is no data using L4MEV neutrons as a source. It is estimated

that 30-40 conversion efficencies in radiolytic decomposition of vater with LAMEV neutrons can result in acceptable hydrogen/ electricity production scenarios.

EER proposal of February 1977 entitled "Feasibility De~ sign Study Project for 4 1OOKWE Level Pilot Plant Fueled by lydrogen Produced by Direct Solar Heat" contains a detailed dis~ cussion of the gost promising thermochemical cycles co that date. ?The use of LAMEV neutrons in a thermochemical step can result in eliminating incovenient high temperature steps of particular svitable thersochenical cycle.

CEER has been in contact with IMS Fusion of Ann Arbor, Michi

in an effort to establish such a program. KMS Fusion is willing to develop a joint effort with CEER in this area. Ta addition, CEER personnel will saintain itself abreast of the now

jelopments ia Fusion

Technology by attending seainars, symposia, reading the Literature and

holding occasional local lectures.

1B. Nuclear Fission Progran

In the field of nuclear fission CEER propotes to eonitor and transfer technological inforsation from the national laboratories to interested CEER/UPR, P. R. industry and Latin Aserican countries inte- rested personnel. Distinguished investigators and professors vill be

invited from time co time to present Findings and developments co CEEL

---Page Break---

personnel, CER personnel will attend national meetings, conferences, symposia, etc.

?Tables¥-1 through XI-4 illustrate the funding and effort scheduled.

---Page Break---

TABLE 1

NUCLEAR PROGRAM

BUDGET (In Thousands $)

8

?A. Nuclear Fusion Program BS

B. duclear Fission Progran 3

TorAL 658080

TABLE X-2

?NUCLEAR PROGRAM

100

105

?BUDGET - PROGRAM PERSONNEL DISTRIBUTION

2 9

Nuclear Program

Scieneific Staff toa 1

Technical staff Boss

Adpinistrative Staff no

TABLE x3

-MUCLEAR PROGRAM

?TWPE OF RESEARCH

a 83 Bk

Nuclear Program

Basic Research 6 7S

Developaene

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Education & Training ss 5

105

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Personnel

Equipment 6 Materials

Services

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?iwrecpareD PROGRAM PLAN TOR UPR/CEER

?Fx 1980 aN FY 1981,

Incroduction

The Comeil of Higher Education authorized the establishment of GHER effective July 1, 1976 after one year succesful negotiation ?vith ERDA (now DOE). The negotiations vith ERDA (nov DOE) were sum sarized in an action menorandun dated April 11, 1976, The establiah-

nent of CEER phased out the operation of the P. R. Nucl ue Center (PRC)

which had been in operation since 1957. This change was a reault of

the new needs to focus on the changing world energy situation.

A document was prepared in April 1977 entitled "Integrai

1d Program

Plan for UPR/CEER FY 1977-82". It consisted of a 50 pages plus five

appendixes entitled: (1) Biomass Research, (II) Solar Research,

(141) Solar Materials Ret

ech, (IV) Conservation Research, and (V) Bio-

conversion Research+ This document vas to serve as a guide for energy

und research prograns for the recently established CEER organization.

The prograns described in the above document and the funding and

budget allocations have undergone changes and revisions. These changes and revisions are the result of the natural developsent proces

search findings, budget restriction

tise schedute reetrictions, persoo-

el availability, nevly set priorities, ete, This dociment revises the

original Integrated Program Plan, establishing sev plano for the FY 1980

sod Fr 1981,

peers CEER- AW

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carn organisation

The original organization chart of GEIR indicated four wai Di-

visions: (4) Bane Prograne, (6) Biomedical Research, (<) Bovironsen-

al Research end () thorny Research, a addition to the above Divisions

there were five adninistrative units attached to the Center's Director?

Office: (a) Wealth and Safety, (b) Training and Education, (c) Adminie~ tration and Services, (4) Technical Services and (e) Facility Deconte- mination.

Various organizational changes have occurred during the period mainly due to program reorientation, budget restrictions, personnel availability, ete.

Figure 1 {s the present CEER organization chart. As can be seen ia Figure 1, there are five main Divisions as follove: a) Solar; >) OTE; Environmental Sciences Comprising c) Marine Ecology, 4) Terrestrial Ecology; and ¢) Biouaso, There are five adninistrative unite attached to the Director's Office: a) Energy Assessment and Ana late; >) Public Avarencas; ¢) Library; 4) Administration and Support

Services, and e) Health and Safety,

Budget Restriction

?The greatest changes ocurring in the original prograns are nainly

due to Budget Restrictions.

Table 1 "Federal Funding? promised for CEER/UPR Transition Period?

shova the funding assignments contained in the referenced April 11,1976

RDA (DOB) Action Mesorandum, The dollars indicat

in Table I are FY

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JORS, 0 public Rearing was beld in San Juan,

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sort (yortions of ?hich may be submitted and evaluated

ind the Conmigsicn ehall fn that the final design,

aunerneater, end dete developed from the specified

p experiment? progruas, incluting the integrity of the

verre, provide reasonable assurance that the health and

gafery of tbe pools tii! not be endangered and that the operation of

the feclldty wlll net be inusieal io the common defense and security ag

requires ty the Avent: tnengy Aet, @2 anended.

fon shal? te wade of nuclear fuel for the proposed

suilica:ton fectiity until furtter bearing and determi

Commtscicn, whieh shall be held respecting operating

Gsthoriastion after the coupletion of the construotion of this fecility.

"ge Eecoptions, if ony, ané brief in cupport thereof must be filed by July 18, 195C; UMets in opposition thereto shall te filed by July 20, 1960, and #f' the Cemmiacion does not initiote a review on its om notion, én no exseptions are filed, this vecision shall, in accordance with the Cousission's Rules of Practice, become final on July 19, 1960,"

?There being no exceptions filed, the stove decision becune final on July 15, 1960.

a

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EPACE

BOWS Nuclear Power Station Located near Rincon, on the western

© morte Rico, t¢ owned josatly by the United States Atoate Energy

ievion and the Puerto Rico Water Resources Authority (PRGA). The

part inttial operation of the reactor and plant have been con-

Tes Geerat ine Author scation No DEAK, Issued Jointly to

ng, tne Sand PABA, with the responcibslity:

Plant opera! vis and activities assigned to CEND.

reactor ta of the lnant water Bolling type with integral

La rated 50 Mw!) at 975 pots ant 900°F. Superheated stean

fs the guserheater fuel zone af the reactor core ts supplied

2 the 17,300 kw turkom generator in A steas/Teedyater cycle

ve nearing of the feedwater to 35K°F prior to ieved snitial ersticality on April 13, 2964,

visting of 30 of the eventual total of 64 boller fuel

Or Dacenter 14, .965, the startup phase of BONIS operations

She guscenity: coneiusion of & full pover desonstration

che rouctor was operated with its futl complement of fuel at

Geatgn there coiditions and tae power generation equipnent delivered

Spimateiy 95 pesceat of generator capacity to the gra ervening tine, a relatively large number of core configu>

ex ie were tected ant analyzed 29 estublish thelr nuclear, thermal, and

erlsties. The core configh ied under cold

experinent conditions were the fLiowing:

6 x6 bolier assexbiy without boiler shins

bly vith boiler shins

roly with So:ier shims

Reduced BORIS cor

FALL BOR cor

In adzition to these coid experaments, extensive tests under hot operating

wer conditions were conducted on the B'x 8 boiler core, the reduced

elenent) euperneater core and the ful! BONS core to evaluate their

Ruclear control and thernel characteristics during steady-state and tran-

Stent operating modes. The sequence of the enperiments conducted and

Other milestones of BOWS aperation are presented in the chronoto

Bictory tabulated below

1

The experinents described in this report represent the preoperations]

sealyois program defined {n Modification No 16 to Contract AT(0-1)-2674.

?The report has been prepared in fulfillment of the requirements of Modifi-

cation No. 16 and in order to provide giiaence to the Puerto Rico Water

Resources Authority for subsequent plart operation,

---Page Break---

ich as the aes

Toe n details of the BONUS reactor end pant have been

sdeguviely desset EOS documents, sanely, the Final Karards

Fe 5; tne Technical Specifications; the Pinal

ary ub! gn Report, PRARA-GNEC-(, und the Startup Sumcary Feport,

7, TAveLe ingerip!ive mutter relating to desiyn aspects has

teen presented in this report. It is astuned that the reader fo ac-

goa vied with the BOS reactor and its plant systens. :

CHRONOLCGLCAL HISTORY OF BONUS OPERATION

operntion

Instial lowding of 6 % 6 potler fued

ye aprit 13 Initial criticality with 6 x ? unshinned boiler core

April MSatune 24 Covd and hot critical experiments at. zero power with

full core to measure nuclear characteristics

galy 1-5, Co'd ?ritscal experiments in preparation for power

on with byller sore

poration sith boiler core

chectrica? generation during tet

Sine generator with saturated steam

Dover operation with eofler core up to & maxinun ?of

30 tule}

fot critical oxperinen:

G tte) witn full core

aly !7-papust Lh

operation of

and reduced power operation

Sturt of cold critical experinents on the reduced,

2iesuperheater assembly core

Pevrusry Start of power operation with reduced core apres First electricel gereration utilizing superheated

stan witn reduced core

sey Pe Mex mum steady-state power of HO Mu(t), 7.1 rhe)

with reduced core reseed

aupves Ful Sore eriticals and reactor power to 10 x(t)

X Septenter ¥ Ful. 90 Mw/t) reactor power Level with a1] reactor

stean bypassed to condens

K seprenver 20 Turbine ioaded to 16 Mule)

November 9-10 Reactor overload test at 55 tw(t) and generator maxt~

pun capability of 19.2 ¥w(e) (gross)

AH Cieenver 18 = + put poser demonstration run, 9965 Hw(e)-ne

X Decener 19 Completion of startup period

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1, ENTRODUCTION

PROGRAM OBJECTIVES

?The ABC and the PRWRA had agreed to terminate operation of the BONUS

reactor facility and to decommission the plant. The type of decommissioning

selceted includes such key features as;

1 Removal from the site of all special nuclear materials
and certain highly activated components such as the controt
rods and shims,

2. In-place ?entombment"? of the pressure vessel and associated
internal components within the biological shield.

3. Decontamination of the contaminated systems external to

the entombment boundary so that they may be left in place.

?The decommissioned plant was to be left in a condition where radiation and contamination levels were suffi

ently low to allow for unrestricted access by members of the general public when the facility was open to the public. This goal is particularly important since the facility 1s to be used as an exhibition

center for a number of years immediately following decommissioning.

1.2 PROGRAM APPROVAL

?On May 26, 1969, PRWRA requested authorization from the AEC, Division of Reactor Licensing, t2 dismantle the BONUS Reactor. On August 11, 1969, DRL

---Page Break---

issued the order authorizing dismantling of (the BONUS! facility (Reference 1).

.s order include the following stipulations:

1, Dismantling of the facility shall be in accordance with the PRWRA application of May 26, 1969, and the Decommis-

sioning Plan (Reference 2) submitted therewith,

2, After completion of the dismantling and decontamination of the facility, PRWRA shall submit a report describing the condition of

Femaining structure and the post-de~ commissioning surveillance program,

3. A post-decommissioning inspection will be made by repre-

sentatives of the Commission.

1.8 PROGRAM SUMMARY

1.3.1. End Product Description

?The total radioactive inventory remaining in the decommissioned BONUS plant 1s 54,284 curies (C). Of this 13.8 millicuries (mC) are contained in the form of scale, in piptng and components external to the entombment system, the remainder is contained within the entombment system. The inventory, as a

function of time, is as follows:

Entombment Syste

Date Total C Major Nuclides, %

Initial (Aug. 1968) $4,288 Fe(63), Co!(29), Co'(4), Mn*(2),

ni8Q)

50 yr (year 2018) 600 (96), Co(4)

140 yr (year 2108) 296 wi"*(100), co? (<1)

---Page Break---

BONUS NUCLEAR POWER FACILITY

Decommissioned 1970

?Entombed in this structure are radioactive materials which

could be hazardous if exposed, Entry is prohibited without

specific authorization irom appropriate officials of the Com=

monwealth of Puerto ico, If the structure is breached, va~

cate the premises promptly and notify the Public Health De~

partment of the Commonwealth of Puerto Rico immediately.

?A capsule containing drawings and technical data relative to this facility is buried in the structure. Its location and a de~ scription of its contents may be found in the records of the Puerto Rico Water Resources Authority, Main Otfice, at San Juan, Puerto Rico.

3 Main Floor Reading Level

A plaque containing the following text, in English and Spanish, will be set 1n the concreté surface at the main floor reading level. .

BONUS NUCLEAR POWER FACILITY

CONSTRUCTED AND OPERATED JOINTLY BY THE PUERTO RICO WATER RESOURCES AUTHORITY AND THE U.S. ATOM- IC ENERGY COMMISSION TO DEMONSTRATE THE TECENOL~ (OGY OF BOILING WATER-NUCLEAR SUPERHEAT. IT AC- COMPLISHED ITS OBJECTIVE AND WAS DECOMMISSIONED IN 1970.

?Entombed in this structure are radioactive materials which could be hazardous if exposed, Entry is prohibited without specific authorization from appropriate officials of the Com-

?monweaith of Puerto Rico. If the structure is breached, va~

cate the premises promptly and notify the Public Health De-

partment of the Commonwealth of Puerto Rico immediately.

A capsule containing drawings and technical data relative to

this facility is buried in the structure, Its location and a de-

scription of its contents may be found in the records of the

Puerto Rico Water Resources Authority, Main Office, at San

Juan, Puerto Rico,

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necessary for the delivery of fuel and ausiary equipment: and the

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Environmental Conservation in Industrial Area Development?

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Presidente Junta de Planiticocion

frated 27

Sonteres, Puerto Sle 00713 i

Central Termonuclesr Tortuiscre

Caries de: 17 ce septiembre do 1763,

14 de junio ee 1959

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7 60 worzo de 1953

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edo Nonche:

Esta Autorided rometlé @ ta Junta de Flaniticacisn con fecha 1?

ec septiembre ce 1953 una coniulta Ge ubicaciée pore te Conic! Termonvetear

?ol crite ce fe Laguna Tortusuero on la eunicizolided de Nonatt. tn nuestra

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nuclear oe Fortugyore @ Iniistimos scbre la nccesisad do otiit=

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skcerando rerleseste los terrenos de Tortuguero pare ol estudlecimiento ce uns

central tormonucleor.

EL 21 de noviembre de 1966 10 eolebed una viste pdbtica en el

do Monat en relocién o la vileacién de este proyecto. La Autorides

eseribib. y expuio el proyecto, contesté preguntas, y uid Cniesis scbre la sccu-

tldod de este tino de instolacién. En cicha visto ptvlica no hie oran «.2e3t~

?lin, pero el Alcalde, Hon. Jooquin Kosa, picib que se dicta 12 evortunie 2

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Febrero de 1957 @ los 7:30 P24. En cichs visto pOulica un crupo excatter of

proyecto presunts @ un tol Adolph J. Ackerman ee icuivon, ssizcomin cone sy

Ccorsulter en estos osuntos nuclearas, Cade que es ccttunbre de toss los incivi~

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Como redeé desprenderse de esto correspondencia, podem rotor eve el :r. Ackerman no tien ecaccinientos ni experiencia aljuna tabre glentas ter= moeldetrice: y mons solee plantas nucleorss tiendo complciarente un lop en esta motcrie. Selo loventa uno serie de gensraticaden. En la pégina le de los minutos det Concrero que 40 incluyen, oxrén obtervar lar cenclusioncs a que Moya el ?Advisory Cemaittee of Reactor Saicsuords" que so resumen: (I) to furdemento para sstenar ninguna de los elezociones del Se. Acixemian. (2) Se opunta la gran ignorcacia del Se. fckerman.

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Ono

Tratcl V. Urrutia

Director Ejecutive

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RAMON GARCIA SANTIAGO

Presidents

HARRY MALDOHADO

Secreto

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8 de mer

» de 17

Re: Central Termonuelear Tortuguero.

Corts de: 17 de weattembre de 1763

14 de junio de 1965

A de junio de 1765,

7 de marzo da 1958

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?estos terremos pero este: propiiitos, En lo ecmunleccisa de 21 de junio de

1925 trcrenitines © e12 Henorcble Junta lnfoemeciéa relotiva @ estudior del wb-

sclo. Con fecha del 7 ¢2 morzo de 1945 sometimes @ e1a Honcroble Junta

los plenos de mencura de lex Aincar conecrnides y solicitanos oprobocién de to

Junts pora la ecquisictén de estos terrencs. En nuestra conunlcoeién del Il de

?cct-bre de 1965 volvimet @ notificar @ le Junta que lo Autoridad continua con

Mc rando terfonente lor terranot de Tortuguero pore ef extcbleciniento de uno

centol ternonveleor.

El 21 de noviembre de 1966 10 colebré. uno visto péblicn en el Mum ictpio de Nonotf an talacitn @ la ubleocién de este proyecto. La Autorided describ y expuso al proyecto, contesté preguntas, 7 di6 nfasis sobre lo segu~ Tidod do esto tipo de tmtolecion. Fo dicho vito pblica mo hubo gon opesi= tlén, pero ! Alcalde, Hon. Joagutn Roxa, pidié que 10 diera fa cportuniéod

de une segunda vito pébliea. fate tagurea visto poblica se ij6 poro al 27 de fetvero d= 1967 @ los 7:00 ake diche vista poblies un grupo opcsitor of proyecto preienté oun tal AdoIgi-J. Ackerman de Mocisen, Wisconsin come wy Somultor en erfos enintor muclecres. Caco que er eothamira de tees lop Irvivi= dics que se cpcnen ol extetlecinieato de lor centrales nucleores orion duce

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tor sobre Seguridad Ge Recetores (Advisory Committe on Reactor Sefe.verss) (ACES)

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10-623-P - Third Faremsion

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U.S, Atomic Enetey

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June 25, 1973

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From

The preliminary study for intend nuclear plant siting along the coast of

ro Rico ?ine been practically fiatehed, The etudy includes all the coaat

of Puerto Rico excert the area included between Dorado city east to Lae

Csbezas in Fajardo and the area betwwen Aguirre and Ponce. These two

areas were excluded because in the first area tourism and population concen-

trations prohibit the location of power piante and the second area wae excluded

because enough information '# available from previous studies.

From the preliminary information developed the north central const of Suerto Rico (Arecibo to just saat of Tortuguero) haa the highest potential for uciesr slunt slice, Other aren tuch ae Cobo Mats Paecvm in Pauline, Punta Versace. Merrilion de Cnbo Rojo. Rincén, Agvadilia up to teabela hae been ound to be with offshore sedimentary layern reverely tilted, folded and faulted Sisugh the prelisrirary study doer not role out completely wach eites, it ie ed Uiat they will face more difficols probleme im the licensing process,

?The area cast of Ieabela and epecially cast of Arecibo shows markedly miles and miles of sedimentary miocene rock (20 million yeare old) undisturbed, There are however some minor faults buried at an estimated depth of 2500 below the aca floor and overlaid by undisturbed miocene rocks.

One of the faults has been found from the offshore seismic data to have an cachvest etrike with southern inclination a few miles eaat of Punta Chivato, i.e. the fault enters the Leland east of Punta Chivato. However since apparcatly the fault le deeply beried (indicating it iw an old fault) the geologists have not been able

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Eng. Jotio Ne

dove 28, 1973

to flad any trace or j2olugic fnature indicating the presence of

inland. The fault jot happens io he fart

Tortuguero site fabout 1

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nmendation of the Geologinte and

tat lovet two of these rites should be

wed 10 drop at this time the Punta

? (il is the closest one to the minor

AL Gestogical

Make ground trenches east of Penta Chivato where the fault

tere land to determine ifit*present and any characteristics, Haak pick samples in th

Sec ouite respected to be

oxet,

Areas where quaternary eolian

tw-cen 100, 090 to 1, 000, 000 yeare

Theee oi

ay Red

ting will be performed by various techniques sneluding :

etrie 5) Patearsagnetists ¢) Amino-acid.

3. Make drill hotes in the arca to determine etatigraphy and

foundation mechanics,

At Tortuguero probably one or two holes

previous drill holes made in the area.

wll be required.

will be enovgh to ealibrat

At Tslote a new series of drill holes

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Pag. Jeo Negront

June #5, 1973

3. Seiamological

Perform detailed and cloce high resolution eelemle profiles offshore

in front of the two sites ind at cri.ical sotate such ae east of Punta Chivaio

here the supposed fault sir!" ?nuard, ?The will try to prove without doubt

of undisturhed s-lucens rocks above offshore faults for fault ee. Pe fcltsle lines inland required

ts determined irom proviova Weston data at Tortugzero.

The preliminary work alre=ty performed will be wrapped vp in a com-

prehenrive report which will be ready by end of August, After the Authority

i ©. The A.E.C. might

celves it, it should be submitied fers ally to the A.

the tec oF three menths in rroceating and giving ee their opinion.

It fa my recomme

continue te det

np Hat we ehould not wait for an ALE.C. ruling

Ned rtudice pisviously described. At leaat rix months or

y will be expariienced. Coat to the Authority in ?interest during

tiozal forsil foel corta in competence with the

tear voit ete. {9 tn the range of snany many millions of Zollare.

cone*rvetion" eseatstion, a4

there ta a good reasonable probability that Tortuguero as well aa Islote

oF Patwan A'las rite can be Icereed within 18.21 montha if we act promptly and corzectly.

I therefore request your approval to continue the geo- seismic studies

for Tortuguero and the Islote area and simultaneously start the preparation of

a PEAR and EIS for Tslote (with Tortugvero ae an alternate site) with a target

Cate of March 31, 1674 for filing with the A, E.C. euch TSAR,

1p. Couniact 0? APPROVED:

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fois, Chew Julio Negroat

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GENERAL CONSIDERATION

AND. PRE LIMINARY INPUTS

TO AGRO-INDUSTRIAL

NUCLEAR ENERGY CENTER

1968-69

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ACKNOWLEDGMENT

The Committee for the Energy Center Study was appointed by the Directors of the participating Common-wealth Agencies and Federal Goverament Divisions on September18, 1968. Its functions are to coordinate all the activities related to this study and provide, through its Manager, an effective assistance to the organization or firm contracted to carry on the work.

The effort and dedication of the members of the Committee made possible the recopilation of the data and

information included in this brochure, entitled "General

Consideration and Preliminary Inputs to the Agro-Industrial

Nuclear Energy Cente:

PRWRA - January 22, 1969

---Page Break---

FOR THE FEGIONAL DEVELOPMENT

1 RICO

A. Introduction

During the last quarter of a ce:

cys Purrto Rico has experienced

a rapid and impressive development. The gross product of Puerto Rican

romoniy surpassed 3.3 billion dollars in 1966-67, more than eleven ticnes

the 1940 figures, Similarly, per capita income was $1,037, compared

to $121 in 1940. In the fietds of education, public health, transportation

ant public utilities, unprecedented progress has been mate, However,

this same progeess have introduced many complex problems, such as pollution, traffic congestion and shortages in the public facility services

To solve these and other problems it 1s the pultcy of the Government

bf the Commonwealth of Puerto Rico to encourage development in certain

growth poles, promising centers, like Ponce and Mayaguez. (See Map

93 in appendix on growth centers.) The effectuation of this policy is

necessary, among other reasons, in order to create in them favorable

environments for the development of Industry and also for the develop

ment of attractive residential environments for the professional, mane

gerial and technical achievers of the growth pursued. This will also

reduce the flow of persons to Metropolitan San Juan while reducing also

the regional disparities in employm:

opportunities and income levels

Plans have been already implemented to promote growth in other areas, as for example in the Southwest, in order to counter-

batance the tendency of the incomes in the Southern part of Puerto Rico

to rise very slowly in relation of the incomes in the Northern part,

---Page Break---

The

puthwest Region ~ comprised of the mistropulitan arera of

Ponce and Mayagues and adjoining municipalities - offees a special

epprrtinity for carrying out a joine4 program of development which

Md have a significant influeace in achievin the objective of reducing

income disparities among the three regions of Puerto Rico. In fox

sonsiderable efforts are being aa d= to broaden the Region's econon

base by the promutins. of monu?acturing establishments, the use of

industrial incentives of various types and the improvement of the urban

and regional infrastructure

About 21,000 manufacturing jobs have been created in the Region

under this program

Future plans for industry and agriculture will heavily depend on

the developmeat of water resources duc to the critical aatum of said

resources in the Region High priority has been given to the development

Of the Southwest in the Commonwealth's capital improvement program.

To this effect, the Ptansing Bord is now engaged in the formulation of

a comprehensive development plan for this Region. Emphasis is being

Placed on the formulation of functional plans for achieving the desired

goals on induate

I developaient, tourism, education, agriculture, trans-

Portation, public utilities and complementary community facilities and

23. (See part V of this report for Long Range Goals and Projee

tions, as prepared by the Puerto Rico Planning Board.)

---Page Break---

UNE AND st PPLY OF WATER

REGION OF PUERI

AL Intooduction

?The shortage of water in the southern region of Puesto Rico

is the cause of concern to the Commonwealth Goverame

The prodlew

is becoming a0 eri

WI that many Industeial and agricultuest jota, and

ee Jobs, may de KeDt in abeyance. The

P Hey of the Commonwealth Government is to urgently sek sotutions

to these peobletss am

to design programs and projects meeting the high water consumption needs of heavy industrial comptexes

fn the sunthern eegion:

B.

ion and ite Development

The Suuthoen Region of Puerto Rico has the following contiguncs

1

muunieip-tities:

1 Ponce 8. Santa Isabel

2. Pesuclas 9% Coamo

Gusyanitta 10. Salinas

4. Yauco ML Guayams

5. Gusnica 1, Arroyo

6. duane Diaz 13. Patitlas

7. Villatba 14. Maunabo

?W) See Map #1 with va

1 contours,

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oe

will be approximately $24.3 MGD distributed as follows:

Industry Bed

Agriculture

®

seal 5.9

Commercial 15.0

t

net impound Ble surface water availability is actually approx

imately 202 MoD,

The ground water availability is approximately 217 MGD. As-

Sun ing all this water could be used, and further, assuring that the net

impourdable surface water availability would reivain constant, for the

year 1980 there will be a net deficit of 105.3 MGD in the Southceast region,

(525,3-292.217)

This clearly indicates tha: other sources of water have to be

found to be able to cope with the expected developntent of the area.

Ore of this a ional

na! sources could be the diversion of a

arounts of water from the Northern part of the Island to the Southers

part.

nothe> source (approximately 24,500 acre feet) will be obtained

from the apill-over of the GuayaSa! Damm which will be collected in an

other Dam downstream,

But another promis

5 source Which must aot be overlooked and

?sPlansing Board M.

norandam #410, Water Resources Needs

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The urgent a

for water in the re

wil available sites for dans have ate

the high oust of divesting uster fram the other side of

the central divide, reuresoat a few of the ressons that justify a careful

sooly of nucless

costert that, tn addi theis e genoa.

tiua, will produce large aniuusts of pwable water

The teshnut acy in UL af deaalinvtion is developing ata rapid cars, white the cost of supslyins water to the Southeast increaves. The

rooted water now's far the Suuthogaat represent an extraordinary

and regi ra seeat cuordinited effet, if the development of

wed area ia to be iste a reality,

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Vi ECONOMIC DEVELOPMEN I ADMINISTRATION

AL General Considerations

In reyard to the industrial sector of the overall complex, the

Feonamie Development Administration considers very important the follow

ing general factocs:

1 The area in whieh the energy center comples is to be Locate?

Siontd have an enisting of potential harbor suiticient!y ample to provide

Port iacilities for several heavy industries. The harbor should be at least

5d feet deep and should be in the immediate vicinity of the nuclear powe> plant,

At Lea

000 acres of reasonably level land should be avai lable

on the water front for industrial plant sites,

3. Plant capacity for each product analysed should be of the latest

opiisnum size and incorporate proven technology.

Products utilizing one of more principal raw materials from

foreign sources should be given priority attention since these raw materials

alr

y are flowing toward the U, S, mainland and Puerto Rico is merely

intercepting the flow,

s.

Products chosen for analysis should be those with good prospects

for market growth in the U, S., since the mainland is our major market

outlet,

Products chosen for analysis should require significant amounts

of electrical power per ton of output in their production process.

7. A comparative analysis of production costs in Puerto Rico vis-a~

Vis the optimum mainland location should be made for each product analyzed.

---Page Break---

cts that could be considered for arslysis are the

following:

1. Alumina (

000-3, 000 KWHi/ton = a possibility a

teend in the indastey is to penduce alusiny at dhe brusite site,

2. Aluminum (14, 090-15, 000 KWH/ton) = We already ¥

suck a project 1s feasible in Puerto Rico at 4.25 mills for power, Peo

prition of 24 eventual 300,000 ton/ycar facility to be located in Tortagiery

a Was

ts well advan

id plant is promoted, the Government favors

Yabucoa as the site, Aeesrdingly, the southwest area appears to bea

r

te for a third facility and a project of this axture is accordingly nace bike!

in the late 70" of early 80's, It is not felt that there is a

need to study aluminum since we are well-informed about manufacturing

costs and treads for this product,

Chiorine/eaustic soda (3, 400-4, 000 KWH/ton) = A $00 ton/day

Lorine plant is scheduled to go on stream in 1971 of 1972 in Guayanilla,

The demazd for chlorine is expected to double over the next ten years

© belinve prospects for a second project of this nature are god. However,

le is more likely to be located near one of the existing petrochemical cor plexes at Guayama or Yabucoa. Again no analysis is believed required

since we are well informed about manufacturing costs,

4. Ferro alloys (4,000-3, 000 KWH/ton) = a plant with aa initial

demand of 45 MW is scheduied to go on siream in Ponce. Accordingly,

---Page Break---

could oe geod candidate for the ©

cading on market growth

Graphite (3,009-3, 500 KWH/ton - a plant with an initial and of

Mis is being built tn Yabusoa.

Such @ project could be a

wood candidate for the energy center conples, depending on markets on

5: Ox, gen and ottwr industrial gives - Two tems are proposice

te build an industrial gas comptes in Pefuelas to serve the South Cos at

by pipe Lins. Teds unlikely another plant as required

T. Other peuducts with high energy requirecie

that should be

Fin. Niaion among the products to be anc!yved in detsil are

Comment ant

Current Uy 8, Market

A. calcium exrzide: 3,000 KWH /ton

b. chromium: 2, 600-3, 400 KWEt/ton 1.2 milion tons

?. cobalt: 2, 400-3, 200 KWH/toa 5,000 tons

by product of copoer mining

4. fluorine: 5,600-6, 900 KWH/ton

fe. Lithium: 3

1200-36, 000 KWei/ton

f manganese: 10,000 KWH/ton

Bs magnesium: 22,400 KWH/ton 150, 000 T, increasing

nickel: 2,200 KWH/ton

8. phosphorus: 8, 000-11, 000 KWii/ton

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ee

Je sodiers: 10,400 KSHV tun 125,090 tons

k. ailicon: 10, 000-12, 000 KWHi/ton 700, 000 cons

1. silicon carbide: 7, 000-8, 200 KWH/ton

e, thtaniusa/zeeconium: 30, 000-40, 000 KWH/ton 10, 000-12, 000 tons market small but growing

B. An anslysis of proc

ing 620,000 to 1,000,000 tons of sait

shui alsy be included. The eost of import

1c salt is approximately

55, 32/tns, delivered on the dock. Any reduction below this cost would

vs to acit based industries such as chlorine. Perhaps desali-~

be considered a by-product with sufficient absorption of progiction costs by the salt production which could be sold for $4-$5/toa

Dring the cost of water down

2 res sons!

level fru the present

80¢ /1, 000 gattons.

No processing piants for agricultural products have been

included aince these would depe

6 the type of producte found feasible

for the agvo 5:

stor of the corp!

Likewise, petrochemical compleses

have not Been included

nce these are primarily dependent on obtaining

import quotas for feedstock.

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Anejo 29

IV FACTORS AGAINST A NUGLEAR DECISION

Prototype units -

None of the commercial ynits in operation today is an exact

duplicate of the proposed nuclear unit, It has been a standing policy

of the Authority that the commercial unit proposed for operation in

1976, if nuclear, must be a completely well-proven concept, and if

possible, a duplicate of an existing unit, so that the parameters used

fn the evaluation can be readily ascertained. A duplicate of the unit

?quoted on by Westinghouse will not be in service before 1972. Connectie

Yankee, which has been advertised as a prototype of the quot! unit,

differs in a very vital aspect: nuclear fuel condi

1) The specific power, that is, the full load thermal

Kitowatts obtained from each kilogram of vsanium in

the core is 27.7 at Connecticut Yankee, while the Puerto

Rico unit would have a value of 36.5. This reduces core

size. Connecticut Yankee thus operates under more conservative conditions.

---Page Break---

2) ?The fuel burn up, that is, the kilowatt-days obtained from each kilogram of uranium at Connecticut Yankee is 24,000, while the proposed unit would have a fuel

burn up of 31,500. While this increased burn up has been obtained in other reactors, it has never been proven under operating conditions in the type of reactor

that has been proposed. Connecticut Yankee, therefore,

is operating more conservatively in thi

respect.

3) Fuel cladding - Connecticut Yankee uses stainless uteel cladding, while the proposed unit will use tirealoy. Although technically sircaloy should be satisfactory the fact is that this type of cladding has

not been used in commercial PWR reactors of the type

and size whi h have been proposed.

These very /-aportant differences pose the probability of technical

problems and the probable requirement of further debugging. Even

more important, however, is the fact that the fuel costs wt

ch have

been predicated under these accelerated conditions have not yet been

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Tealized, It should be noted that fuel costs have a very i

portant

bearing on the economical evaluation of the nuclear unit.

?The accuracy of nuclear estimates is in question today. None

of the nuclear plants built so far have met the estimated construction costs, The additional costs have ranged from 10% to 50% above the estimate. These hove been caused by delays in the delivery of materials,

labor problems, the difficulty of obtaini

the highly specialized work-
ers and technicians which are required for a nuclear installation and very importart, the additional cost of back fitting requirements imposed by the Commission.

It should be noted that even though the evaluaied cost of nuclear

unit in our studies is of the order of $200 per kilowatt for a $70 Mwe Plant, higher cost figures ?ive been estimated by some very well known advocates of nuclear power.

1. From APPA Nuctear Power Newsletter. Aprit 1969 -

(Ex. = 3-9)

"In some plants under construction or in operation, problems

where experience is available to have avoided

foner, James T. Ramey said. Ramey noted

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that construction costs have risen for nuclear units (a recent survey

by Yankee Atomic Electric indicated that the average 825, 000 kilo.

watl light water reactor plant being built in the U. S. for mid or late

1973 start up will cost about 200 dollars per kilowatt). (Ex. 4-2)

From the Special Report ?!Nuctear Power in a Billion

Dollar Stalemate, "Electric Light and Power, Apeil 1969 (Ex. 3-4)

"Nuclear power's soaring costs are being watched closely.

Every utility executive contacted had facts and figures at his finger-tips ... facts that showed original estimates and the effect of time delays on these estimates. Typical of the cost problem is Omaha Public Power announcement that their 1966 cast est: nate of $93,

jon had jumped $30 millivn by the end of 1968. New York State Electric and Gas estimated their costs will be $35 million higher than the 1966 figures. Other utilities not so eager to share their escalation costs openly, have indicated that as much as §20 millior. have been added to capital costs before ground wat broke

3. From the paper Nuclear Power - "Past, Present, Future" by Kenneth A. Roe, Pres, of Burns & Roe Inc., presented at ASME

Power Division, January 1969. (Ex. 4-1)

"The other major cisappoinement felt by the utility industey in

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their nuclear pro;

ris has been the tremendous increase

capital

costs associated with naclear plants. Many factors have contributed

to those highcr costs

One factor is attributable to the extended construction schedule

and decreased construction labor efficiency. Some of the cost increase

is due to inaccurate estimating since limited experience was available

to form the basis of goor estimates. Part of it is due to escalation of

materials and labor rates. Another increment is due to the increased

number and cost of safety features that must be incorporated in these

tants as the AEC digs deeper into the design features and examines

? Ps

their potential hazards with ever increasing care.

In our present studies and designs for utility clients we are

estimating nuctear plants that will be operating in 1974 ar? in sizes

0f 800 to 1000 MW. The costs of these plants appeat to be in the

range of $180 to $200 per KW."

In the light of the above statements it seems that car ertinstz=

for the construction of nuclear units is in the low side.

3. Uncertainty of nuclear fu

?The main economic advantage of nuclear power is the reduced

cost of nuclear fuel. In the economic study and in the bi! evaiuation

the low figure of 1.338 mills per kilowatt-hour has beca used. This

---Page Break---

has been calculated on a price of $8.50 per pound of uranium, ?This
figure seoms to be Jow, especially when the Edison Electric Institute
has propared a chart indicating that "all the uranium that might be
found and prosuced at $15 a pound will be consumed by 1990." (1)

Mr, Rangel, Vice President and General Manager of the Atomic
Power Division, Westinghouse Electric Corporation in the article
"Only High Gain Breeder Reactors can Stabilize Uranium fael Reguire-
ments", Westinghouse Enginece, January 1968 states: (Fx. -3-14)

?Even though presently known d

mestic supplies of low cost uranium
are continuously enlarged by massive explo-ation efforts, fuel cost of
water reactors will always be sribject to the uncertain ies of uranium

wre costs if water reactors ar+ the only type built, Thus, the really

significant potential benefit of the breeder reaciar to the electric utility industry will come from its ability to ensure continaing low

nuclear fuel cost." Mr, Rangel has calculated that for exch $5 per pound increase in the cost of uranium, PWR fue? cycle costs will increase about 0,3 mills per kilowatt-hour, and concludes that breeder reactors are required in order to stabilize nuclear fucl costs, Unfortunately,

(1) Water Control News No. 18 - September 34, 1968 - Page 2

(Ex. 3-8)

---Page Break---

+7.

it fs a vory well known fact that the state of development of breeder reactors is very slow, and the outlook is rather pesimistic at this moment, Nuclear fuel costs as used in the econo:nic evaluations seem optimistic. For exemple: Mr. W. W, Braadfon of Sargent & Luney

is reported in Flectrical Wort

|, October 14, 1968 (Ex. 3-10) as stating that "taking 2 1000 megawatt pressurized water reactor as an example and projecting the total capital requirements for nuclear fuel at any one time as varying between 28 million and 33 million dollars, using an 85% capacity factor over the first seven to ten years of operation, he got 2 levelized fuel vost of about 2 mills per kilowatt-hour", The cost of 2 mills per kilowatt-hour as developed by

Mr. Brandfon would definitely rule out nucica> anits in our case.

?These conclusions came ou: in the Atomic Industrial Forum's Conference fon Finance Fuel in New Jersey, October 1968,

4. Schedules and deliveries -

?The situation on schedules and deliveries in the nucleae industry is very pesimistic today. The delays are a constant source of worry to power systems that have conumitted nuclear units with the result

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- ee

Ghat the practical val

of the nuclear plants under construction has

not been proved. As such, the plants are licenced under the R & D

stipulation of the Atomic Energy Act and Antitrust hearings are not

permitted during the licensing prececdings."

6

Energy Commission in plant operations -

This is considered a very important factor. Due to the intrinsie nature of nuclear plants, the Atomic Energy Commission not only closely scrutinires the construction of the unit) but also supervises very closely its operation throughout its life, Specially after maintersce 0 equipment trouble, the Commission makes an intensive study of the Sreakage zd will not allow the restart of the unit until a very thorns

evaluation of the con:

fon fs made and aesurve that all safety precautions have been taken Zare of! Although this is necessary from a safety standpoint, i seriously impedes the ability of the utility to supply continuous snd uninterrupted power to ite cofumners

Normall;, i 4 boiler fan faite in a conventional unit, the

utility will immediately take steps to repair it and the'unit fs back $n

operation in the shortest possible time, In nuclear plants, however,

in case of a small reactor leakage or a pump failure in the coolant

---Page Break---

2.

system, the Commission will intervene and will make a very thorough

inspection and evaluation of the incident and wit! not permit the restarting

of the unit until all assurances have been made that the failure has been

corrected, and that all necessary precautions have been met to prevent

reoccurrence, This action dolays the restoration of the unit back

in the line, serfousiy impairing the utility's ability to serve power to

its consumers. For systems within the Continental U.S. this may not be a very important consideration, since the interconnections will allow a certain nature of protection between the systems. However, in Puerto Rico, being an isolated system, a delayed outage of this sort may become very critical.

Furthermore, in the U. S., due to the proximity to the supply

sources and the availabi

ity of trained personnel, the reprirs will be

Pe

accelerated permitting the res!

wrt of the unit in the ?shortest possible

time. In Puerto Rico, an additional difficulty arises dus to the fact that

neither the personnel nor the parts are available on short netics ting

?One of the most important factors which have led utilities in

the U, S. to seriously consider backing out of nuclear reactors is

---Page Break---

system is a moving target. Changes in design can come at any time

and on any system. ?This ean affect bath plant costs and achedules

Gosts also go up because of redundancy that often goes beyoud

engineering necessity. it dovs not seem reasonable to develop a

sofeguard for a hypothetical event that has lready been precluded by

another safeguard?,

8. Need for specialized personnel -

Nuctear plants require highly specialized personnel in all

phases of construction and operation. ?The Authority acquired sub-

stantial experience from Bonus, but even the highly trained operati personnel developed by the Authority would have to undergo epecial?zed

training in order to operate the large seale nuclear reactors that are

planned for the future. But even more important are the requirements

for specialized personnel during the construction process, If some-

"

g has becn learned out of past experience, it is that nuclear plants

require much more specialization in all phases of the construction

process, including erection, welding and electri

al connections. Due

to the large number of nuclear orders during the years 1966 and 1967, kind of specialized personnel is in short order today. Furthermore,

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-e

of personne} is not available in Puerto Rico. We will have

this kin

to develop specialized personnel by the slow and painful process of

training people in the United States, or else we will have to import

Whese skilled workers, eraftsnion, or technicians at a great cost

?The shortage of highly specialized personnel and the competition

within the industry for the available services is a somber problem

facing the industey.

9. Financia! market conditions -

hi

'# a very important consideration. The nuclear units

will regu

¢ at least a forty-million dollar expenditure per unit over

and above the cost of an equivalent fossil-fired unit. Although the

Authority's financial position is such that it can obtain these funds if

necessary, the present shortage of money in the financis? market

will not make this an easy task, The nuclear altérnetive requires a

larger debt to equity ratio, anda wise financial strategy indicates that

vader the present money market conditions the Authority ehovl4 Nmit

its expansion pattern to the lowest possible figures, and restrict its future expenditures to the bare essential needs.

To go into the market for a larger amount not only lowers the

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<6.

coverage of the Authority as defined by the Trust Indenture, but also

may-increase the interest rates and could probably affect the rating

of

RWRA bonds in the financial circles.

has been determined thet the Authority has the earning

ceaprvity, and te financial backboae fo withstand these conditions

However, it is wise to be cautious in the light of the present money market conditions, unless a very compulsive economic incentive is

bein

the decision to go for larger amounts of money.

It is for this reason that the return on investment method of fixed charges evaluation as proposed by Mr. Walton Seymour, seems to be a prudent course. It also appears advisable that the return on investment should not be beiow the actual cost of money, that is, at least

5. 5% 0 that it can bear the test of a prudentis investment, Undoubtedly, any decision based on cast flow, which might endanger the formation of equity, based on long range predictions which cannot be ascertained

under present conditions, is very risky in the I, it of the present financial

situation.

It should be noted that the Authority's coverage, which at

present is in the order of 2.3 and which has been steadily increasing

during the past years, is expect-c to dip to 1.2 with the nuclear units

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ig.

expansion program. This will not enhance

position of the Authority

in tho financial market in view of its large indebtedness, the present

conditions of scarcity of money and « markct of soaring interest rates,

10. Gyelig pattern of nuclear sales -

It appoars that the Authority's bid came out at a very unfavorable

point of the nuctear sales eycle, The years 1966 and t967 saw a great boom in the ordering and announcements of new nuctear units (1) While in 1965 nuclear sates amounted to only 27% of all the power plant additions during the year; during 1966, 63% of the total capacity announced during the year was in nuclear units. That is, a total of 22, 477 megawatt electric out of an iniustey total of 42,573 megawatt

electric. This trend slowed down dtcing 1967, but still showed a

healthy 45% of total sales and the total ain mint of nuclear capacity

announced during the yer~ increased to 26,460 m

gawatts electric.

During 1968 the announcements on nuclear units declined only 35% of

the total and the amount decreased to 15,168 Mw? Dust the last

part of the year 1968, delays, increased eve.s and operating problems,

specially in the nuclear units under construction shocked the industry

(1) Central Station Nuclear Plants - (Ex. 3-15) AEC Divisi

Industrial Participation - January 7, 1969

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experience, Considerable pressure was brought at Manati by a large comuuinity group with political overtones against the establishment of a nuclear unit in the vicinity. The Authority was finally able to convince everybody of the safety axpocts of nuclear units. However, these groups have a tendency to regroup ani may in the future hamper oF impede the establishnent of nuclear units. This has happened in the United States quite a number of times.

?The latest scare book, which appeared on the market in

February 1969, is called "The Careless Atom?

by Sheldon Novick

The book is just a recount of several well known nuclear incidents

which do not in the lez st reflect on the excellent safety record of nuclear power reactors. However, it has had the effect of strengthening the campaigis of exsmies of nuclear reactors and it will take some time

before

8 effects are completely eliminated,

15, Decommissioning of auctear plants -

Despite

© Proper maintenance prograr, a time will be reached, |

30 to 50 years, after plant initial operation in which the operation of

4 plant is not economically feasible. This may be so when the end of

the useful plant life is reached of because of obsolescence. When

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this happens in fossil plents, dismantling of the various systems can

be scheduled as if it were a construction job in reverse. The site

can be cleared at relatively low cost, and even @ new modern fossil~

Plant built without too much problems. In the particular case of a nuclear plant the dismantling job sliould be preceded by an AEC

decommissioning program which clearly specifies the end conditions

of the site, ALL equipment which came in contact with the primary

water will be decontaminated. A decontamination program must be

followed and arrangements for removal and burial must be worked out.

Although the occurrence of closing down cf plants is not common, it

?will cost much more to decommission a auclear pl

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Aivege 1965

STATEMENT OF MODIFIED CONCURRENT OPINION

By Rafael R. Ramfrer Just?

Member, Evaluation Come sie

: fale

In its final recommendations in connection with the proposed ins

tallation of a $85,000 KW nuclear generating unit at a much higher cost than an equivalent conventional fossil-fired unit,the Evaluation Committee con- cluded that it is not in the best interests of the Puerto Rico Water Resources Axthority at this time to undertake such a venture,

Tfully agree with this conclusion. Furthermore, I would like to point out that in my opinion the documents submitted in support of the nuclear unit did not cover all the factors that should have been taken into consideration in analyzing this type of anit

CAPITAL COST FACTORS

The estimated cost of the nuclear unit does not include the differential in regard to the land acreage that must be purchased for a nuclear unit, as compared with that needed fez a conventional init. Tt is a well ?enown fact that the nuctear unit requires a radius of hal! a mile or more for a safety zone within which no one will Le allowed toslive. The iavestment differential on this score could conceivably amnount to as mach as §1, 000,900, Another item no. included in the ust of she nuclear unit was the diffe-

rential relating to the cos* of edueoting ar traiuing the personnel that would

operate one oF the other type of plant. In my judgment. this

run into at least $2990, 000,

ferential would

It seems to me that the differential in investment cost between the

nuclear and the conventional unit is too low in comparison with figures which

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fear period. This wocid 9 more in

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2 consideration shoctd have becn given to

Cars in providing service, eqstably diatributed ied, namely generation, :ranwniesion and els-

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age of the seal inves ch the paymeats "tin les of taxes?

prescnt should have been deternirud. Ai a matter of fact, it is two per cents

Sis In Pueeto Rico for property taxes. Tae

she move coxily alte tucles? generation.

Hf all these items of expense nad Seen added on to the other:

mistie evaluation favoring a nuctes> uni: would have decreases

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subject, that nuclear units sre comp,

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No through study was made <0 show,

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1¢ power market and rise the demand

suificient load growth is attained to justify a base load unit that will not "cam

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The coverage ratio is an i

direct operating expenses, for capitatization,

"dee of taxes", insurance, etc.

cation of the margin left ove

interes:, depreciation, contribution

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As far as installed eapacity is concerned, our position at the present time

precarious. Practically all of our major generating units are of the "reheat" type,

intended for 24 hour service and offering very little flexibility for daily shut down,

If we continue adding large basic generating units, especially nuclear ones, the pro-

lem of shutting down at light load will become more serious. In terms of capital

costs, we would be simply replacing conventional basic generation with nuclear basic

generation, at greater original cost, just to obtain slightly lower fuel costs. We would

be increasing the system's total operational cost, thus reducing the coverage margin

available after the "net operating cost." This ie what f call ?cannibalism.?

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ane 26, 7565

Vv SUMMARY AND RECOMMED

This {s one of the most thorough economic evaluation over done by PAWRA and perhaps any power utility towards the decision between nuclear or fossil-fuel generating units. Three independent studios were made. The reputable engineering consulting firms Burns & Roe and Jackson and Moreland Division of United Engineers prepared separate and independent reports. A completely independent production run cost study was performed by the Authority's Planning Division. .The final overall evaluation was prepared by a Special

Commit

1ec appointed by the Executive Director composed of the Vice

Executive Director, the Assistant Executive Director for Power, Electrical Planning, Finance and Personnel, the Chief Engineer, the General Manager for Administration and services and the Power Consultant

?The Burns & Roe studies consist of a bid evaluation, (1)

construction estimates for nuclear and fossil-fired equivalent units (2)

(2) Evaluation Report on Two-500 Mwe Electric Generating Units

B&R EW, O, 2580-03- June 21, 1968

@) Report on 500 Mwe Power Plant - B& R#W.O. 2616-01

April 15, 1968

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and nuclear fuel studies. An economic evaluation based on given parameters was made. An investigation was also made of three nuclear units under construction and three units in operation. (3)

?The Jackson and Moreland reports consist of a bid evaluation, (4) construction cost estimates and an investigation of operating cost parameters of similar plants. (5) Jackson and Moreland made a

positive recommendation in favor of the fossil-fuel alternate. (6)

(3) Investigation and Report on Three Nuclear Stations Under Const-uction an Three units in Operation - B & REW.O. 2706-02 - March 28, 1969

(4) Bid Compa -ison Nuclear Fueled Plants - J & M June 19, 1968

(5) Review of Factors Applying to Nuclear Unit Addition Octobe: 1968

(6) Recommen..ton on Nuclear Generating Capacity for Puerto

Rico Water Resources Authority - J & M - April 11, 1968

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?The Authority conducted a number of generation expansion runs following the established planning criteria, The long range evaluations based on the parameters which were initially chosen favored the

nuclear alternate, :

?The Committee investigated the reasonableness of the pare-meters used in these studies. ?The fixed annual charges used by the Authority's Planning Division and by Jackson and Moreland were discussed in detail. Mr. Walton Seymour, of the Resources and Development Corporation was invited to present his views on this point. It was agreed that the Committee would look .nto the economical evaluation under all valid conditions and that a recommendation for u decision would only be made after the vhole range of situations were thoroughly examined.

The results of the economic studies were found to be marginal

Gertain projections favored the nuclear decision, while a more

fired we

conservative approach favored the fe" ision. No really significant factor could be obtained which pointed with absolute certainty to any one of the criteria used in the studies.

Since no definite economic advantage could be found in favor

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Of any one of the two altornates over the other, a very close scrutiny was made of the overall situation of nuclear units. The commercial Power reactor situation at present is very confusing. A large number Of utilities are backing out of their nuclear commitments because of the general tendency toward increased costs, long delays in deliveries

and ad

tional backfitting demands on the part of the Atomic Energy

Commission,

A number of utilities in the 66! and 67! were committed to

nuclear units in what might be termed ?distress sales" by all manufacturers,

For exemple, stations such as Oyster Creek, the TVA and Turkey Point

were contracted at construction costs of around $100 per kilowatt,

Nuclear power plent construction costs todey are t

eas much. ?The

terms then offered were such that utilities could not refuse them and

in consequence a nuclear boom followed, The aftertnath of this rush of

orders were increase? costs causing the slow down on nuclear orders

thac we are now .xperiencing.

?The Planning Division of the Authority has determined that the

1975 unit is no longer required as @ result of the postponement of the

ALCOA project. Furthermore, it is the recommendation of the Special

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?5.

Committee that the 1976 base load unit be @ fossil-fired unit. This

rocsmmendation is based on the following reasons

1) ?The economic advantages, if any, that are foreseen on

the nuclear units may be offset by circumstances in the future. The

optimistic nuclear forecasts have not yet materialized

2) In the absence of clear economic advantages favoring the

nuclear units, the Authority should follow the conservative attitude of

continuing its present trend of fossil-fuel units expinsion. The Authority

and the entire power utility industry have awery solid and abundant

experienc: on this line,

e nuclear

3) Since com nercial experience on the large s

reactors will cot he available until some ime late in 1972, it is recom-

mended thet no fu.ther nuclear bids be issued until this experience is

available and nuclear costs can be reliably ascertained.

4) The Authority should continue including nuclear units in

its future expane?on <cudies. ?The plansing process should consider

nuclear units in the expansion runs using the cost pardmeters obtained

from past nuclear bids and information that may be obtained by closely

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following the experiences of others. Nuclear developinents should be

watched vory closely, since it is believed that nuclear units wilt

eventually overcome their present difficulties and will compete in

economic terns with the present fossil-fired units used by PRWRA.

Although some of the paramcters used by the Committee are

Aiffercat from those used in the Jackson & Moreland reports, the

Committee is in agreement with the recommendations of the Consulting

Engincers that a nuclear decision should not be made at this time.

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PONCE (AP) ? El ex gobernador Luls A. Ferré dijo cue al constr sa termine como Presidente del Senado So valvers a postularse para cargo electivo alguno, dan do pacoa la juventud

"Force hizo el comentario en Ponce al participar en un programa radial, y coments en tono jocoso: "He cumpll Go ton Puerto Rico por ochenta aos y hay que darle ?nicvae responsabilidades ala Juventud?

il Presidente Fundador del PNP cumplirh proxima- mente 16atos,y asegurd que cumplird el resto de os tres {hog que le quedan como Presidente del Senado.

?Sy no rehayo responsebilidades y siempre cumplo

stadia

?con las cbligaciones que se me encomienda"

"Un grupo de dirigeates del PNP, sobre todo en Ponce, han estado presionando Ferré para que e postule en ei {30 para un nuevo termina como Senador, pero el ex fobePnador fue claro al comentar: ?No creo que VOY & Ser candidate mas nunca

?Sin embargo, carificé que "seguird en disposicion? de ayudar al pusbio de Puerto Rico en funciones de consede- ?ary afadio:"Lo Unico que quiero seguir logrando es que hig sea un pueblo feliz viva en par

"Ferré anunci tambien que se opondra a ta ley de singi- ?alizacion de emplendos publicos que permitael derecho nosles

"EL SERVICIO piblico no debe paralizarse por na-

4a", dilo Ferré. "Le ley que permita la sindicalizacion

4. lon emplendos publicos debe contener una clausula de

sroitraje compulsorio?.

"Anadi6 que la sindleiizacion quiere decir que los bre-

rot tengas oportunidad de dacutir colectivarmente s

\ sites en

Ni

Ihoelga no oe

iFerré se retira en el 80

necesaria para a sindicalizacion?.

?SDebemos tener mucho culdado en evitar que-se

puedan levar a cabo huelgas en perjuicio del servicio

Diblico estaréen contra de cualquer ley que no garant-

Beltane interrupelon de le servicios publicot? afirm®

necesario 1 arbitraje en los palses demoe

?to quigoopinar sobre sl deblan establecerse en la I fades tribunales aborales.

as experiencias sobre gos tribuna

Barrio Islote, de Arecibo

?La plants de Islot e

?como ngenlero creo en ia idea de usar

?en Puerto Rico", dijo Ferré

"EL GOBERNADOR Romero Barcelo prometis duran:

te ln pasada camnpata politica que nose construiria en el

Barrio Islote, de Arecibo, una planta nuclear, luego de

?eunlrae all'con un grupo de Vecinos, a quienes el ex

?Fepresentante Roberto Rexach Bealte leg sievio de por

"Segin eumenta el precio del peti y del cartin

lamas muclearesy ness

7 debemnos empezar a Dus

?ar la manera de lostalarla?, sostuvo el Presidente Fun-

?Stdor del Partido Nuevo Progresista.

Ferré record que en Varios pases del mundo se han

Inetsindo plantas nucleares energéticas?y restb it~

portancta al argumento de supvesias alias geoloaicas en

Ercortea terrestre que podria poner en peligro a segur-

dad del pas.

?Alegs que ?ha ?estudiado culdadosamente? este as.

?pecta'y coments ?os rieyges son compatibles con

?Ceridad de que fe instalen?

"Yo recomendaria que seins

tay que hacerlo pronto, poraue e

combustible, porque el mundo va

* aad.

ieveld que el gobierno eita pagando cinco millones de

elares anuales en intereses por el préstamo de cen

millones que se proyecto invertic para este proyecto.

Indicé que el pals ?no puede vivir sin el funcionamien

?podeuna vigorosa industria?. ?* |

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sae hs 973

NUCLEAR, ENV. @ OAS

sruyo ura

?Uh presttrelon de energia clécLica

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Sugiid a estos efectos gre £2

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Puerto Rico Energy Study

With eecalating pettoloum prices and allaged shortages imminent

Wis essantial forall world communities fo assess inir energy resources

?oan active island community like Puerto Rico, which has no known

fossil tusis of te own, recognizing the need for long range planning in
the development of aliemate sources of energy Is vital to continuing
feonomie sty

For this reason, the Governor of Puerto Rico established an Energy
Ottice in 1972. About the same time the President of the University of
Puerto Rico took another important step 10 secure the future by asking
the Director of CEER Io inate an analysis of alternate energy systems
land to. identify the most promising, economically wable sources. nat
might meet Puerto Rico's growing commercial needs CER responded
{Quickly to the challenge with an extensive investigation

To provide a moaringful scenario for practical development, the
study's principal investigators, ?Modesto arte and Rates!? Sardina
projected the island's needs up 10 the yaar 2020. Potential costs were
Eharted for the period under consideration. and as I! to aramatze Ine
heed for alternate sources of energy. the crescendo of ol prices was also

?The conclusions of the comprehensive examination of Puerto Rico's
?options included 2 highly favorable endorsement of biomass. 80.8 short
term solution. OTEC development was encouraged forthe nest decade. In
Snctner area, though ther cost is curently 100 high, photovolaies might
fvolve 10.8 significant factor by the 1900's Wing energy 18 already beng
fuccesstlly harneased, ut ofall the electrical generation systems
lookea at. this concept presentty appears to be the least favorable In
terms of inital capitol investment. Wing turbines might splace ol!

?cost, But not coal costs

in summary, the soclo-economic implications for Puerto Rico for the develooment of local alternative energy sources indicate beneils in {he ?ange of Bilione of collars cf annual increases in progucthily. and reductions in unemployment by over seven par ont

Fossil Fuels

What are the right physical, chemical and biological charactestics tor Enhanced Heavy Oi Recovery By microbial means? Thal what this project has been attempting to find out. It we fing organisms capable BF releasing crude oll attached to sand or rock matrixes trom margal welt or ?spent wells" and we improve our knowledge "ol the Conditions required for such release, then we can possibiy design a brocess applicable to field conditions. To this end during the past year tte Rave. continued exploring micro-organisms. selected. Wom benzothio: ?Bnene or nigh sulfur. high aromatic crude ols containing media tat are fciive in dhaplacing adsorbed oil. Once good activity on natural ol Dearing ?minerals is found, the active organisms. will be stued for laboratory growth under reservoir conditions insofar 2s known) tor conditions favoring aplimum growth and/or gas or detergent production, Of the mixed aerobic and facultative bacterial systems stuaied in

tne reiaase of cil absorbec to limestone, four were shown activa, Duting thelr period of exposure to the organi substrate tle Wt any acid was produced ruling out oll deplacement by dissolution of the matrh. Since Ive obvious that imestone coula not duplicate the complexity of an ei two, other oll-sand matrizes, incluging natural ones. are curently Being fodid. The simplified models, however, a explored to gain some Insight into. the. mechanism of "ell dlsplacement. Oil? displacement studies were conductes by determining the released ll chemically via

Anejo 32

Mixed culture of aerobic petroleum

egrading microorganisms Ivolated

ftom a Venerusien ite,

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dichromate oxiation. Some olls have been found to give inconsistent ?colors because of charing. In those case= aralytical metnods such as {GC or HPLC are used. OF those Tound active. two of them (V-2047 and V20u8) isolated trom a. Venezuelan underground. oll reservoir were Separated as pure cultures, then were ietiied, and) are. being Characterized for growth under conditions of afferent pH, salt concen= trations, temperature and nutrient limitations. They were also found to feduce the surace tension of the growth media incating sne presence Of biopolymers or biosuractants, The aqueous pase ?obtained HO Guituree of these organiama i the. presence of Morchal tude oll 16 being analyzed for mutagenicity utilizing the Ame't Salmanetia Test.

?Some of the |solated micro-organiame changed the composition of tne oll as evidenced by the. change inthe aromatic/po!ar ftio. and changes sn the pratle of garaflinic compounds before. and after bio treatment. Results indicate that organisms selected for their action on Denvotniophene can grow well-an crude ?while others do vely poorly find are diverse in their nature and tei proportes We would expect the ame ?diversty among. stganisms soloed Tor the pyoperty of

feleasing ol Irom mineral sources

?During the past year informal agreements were reached to jointly

fxolore with Venezuelan selentste and engineere. under DOE-Venezuela

?Suppor, this area of research. Detalles work plans Tor further development

Inte comple held are curently being formulated withthe participation 3

the Venezuelan Institute of Peroleum Teemnology

Community Awareness

CCEER's Efforts In Community Awaraness and PubllePerticpstion

?During Fiscal Year 1980, CEER was actively involved In. community

?awareness programs and public information elated activities in the files ?of energy and the environment. CEER scientists participated In seminars, Wworkanops and lectures and in an advisory capacity with 2 number 0 Brivate and public organizations which have an interest in eaucation, civic work and consumers

Important actvitis in these areas include.

?+ Teennieal and linancal assistance to the Puerto Rico Department of Egucation ?on preparing the program ?Energy. Today and Tomor-row". This program is a. special exibition on the energy crisis, ?ath emphasia on the Puerto Ricen scenario. W fe belng presented ai high schools throughout the island on daly schedule

+ Technical advice and lectures were given by CEER scientific stat as part of the energy and environmental projects of COTACO - Worker's Committee to.'Ais the ?Consumer, a local non-profit consumer ?Organization. Ono of the principal contributions was with project ?Enerso!? which consisted of lectures on energy conservation and stop by stop Inatuctions for the constuction of domestic solr Water Mester. Another activity involved the ?Community Environ ?mental Awareness Project", comprised of a series of lectures and Sleminare to §2 community leaders representing communities. with ?Specific environmental problems throughout the island

?+ Lectures on anergy alternatives and conservation were delivered 10 high schoo! students,

+ AvGna day seminar was given for the League of Woman Voters on

fatteratives. for Ramessing solar energy? such a8. photovoltaics,

biomass, OTEC and energy conservation,

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The U. S. nuclear Power industry cies for help?

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fo. ¥iLLian Mieanda Muctn

Direetoc Ejucutive MISSA, En OO. Ae

Aweoridad Je las Fuentes

Eluviates de Puerte Rico

G2 PLO. Box 1267

Juan, Puceta Rico 00936

stinado licenciade Miranda Narn:

Fa su pasada Asoublea Ordinaria,

el Colegio de Tagenicros, Arqint

ue Puerto Rico nvab:s unt Co

Estudiar 1a Problemttica relacionada von cl Hsia

biccimiento de Centrates Nucloares Cenwratvbees de

Energia Eléetrica en Puerto Rico cono alterietiva

a la soluciéa del problona de energta

en agosto de 1975,

tos y Ageisensores

ion Rspecial para

Esta Conisién ha deterninade que necesita obtener

cierta informvctén y dtias que le permiian evatide

este dificil problema. Es, por lo tanto, que

Fespetuosancnte solieitanos de su agencia qus

@feetGe una presentacidn sobre estos aspectos a

esta ComisiGn sisted ast 10 cons

Como el tiempo oturgido por ta Asinhiea

para rendir tin informe sobre ste. prodtent es Tiaitato

docertamos gto fucse To may pronty posible

Sigeririanos cuaiquiee lunes, martes-o micreaies. eh

Ia-noche durante el mes de novieubre.. Eutre ta

UnTornaci6n que iiceesitarfanos de su Agencia en

ent proscntacion estaria Ian siguientes

Capacidad generatriz a estar en operacisa

para cl aio 1985.

Tipo y capacidad de cada central generates

a instalarse durante esos alos.

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Fado. MATL ioe

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Etowentes

icos que indicaron que ta

central generatriz a ponerse en operseion

en el aio 1985 v ser una central

nuclear de upreciastescnte $50 Hite en pre

ferencia a una coutral f6sil de Ta miss

eapacld:

Resunen de costos de operteién por

en central nuclear y en central {osil.

Tupacto en tarifus de energia eléetrica

cuando iniciec operaciones la primera central

nuclear; segunda; tercera, cuarta, ete.

Organ

gramas actualizados de personal cuya

© base de operacidn radicarad o radica

en la central generatriz (nuclear y 0si}).

Costo de entrenasiento de personal para

central nuctear y para central sil.

Lugares que estan sicndo consideredos pera

centrates yeneratrices adicionales, tanto

hucleares cono {siles (desde 1976?en adelante).

Cantidad de terreno a utilizarse en cada caso

(estiwada sino hay actual). Cantidad

estinada de agua a utilizarse en vada caso

Confiabilidud del sistena eléctrico de Puerto

Rico cuando se instale 1a princra central

nuclear; 1a segunda; 1a tercera; 12 cuarta

¥ 1a quinta. Comparacién si estas unidades

fueran f6siles cn vez de nucleares.

Tnvorsién hecha por 1a Autoridad de 1as Fue

Fluviales en la Contral Nuclear BONUS

Puerto Rico; en 1a deseartada Central Nuclear

de Aguirre, Puerto Rico.

én

Pérdidas ccondmicas reflejadas en Libros

atribuibles a inversiones y gastos relacio-

ntral Nuclear BONUS; con 1a

a descartads Central Nuclear

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1975

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Viva Sirsade turin

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Grac

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ce: Dr. Juan A. Bonnet

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De tedein in Sets

SOM ere

2 de julio de 1976

A 1 Ing. José Francisco Quifones, Presidente

Colegio de tnjonteros, Arauiter tos y Age lowscoes

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De Ing, Rafael cruz Péver¥ Peesicunte

Conisin Investigadora:Problesdtica Plantes ?tucleseas.

Asunto : Comisién Problenstica Pla

as fucteares

En bese a la Resolucién Nim. A-004 de Ta Assubtea Arwel

de nuestra Colegio de 1975, nevbrd usted una Comisicn Inv-stig-dora

corpuesta de Tos siguientes miccbros:

Ing. Rafael Cruz Pérez, Presidente

Agrim, Juan Arvelo Diaz

Arq. Fernindo Irizarry Rodriguez

+ Ing. José E, Antowatte? Cruz

Ing. Alfredo Herez Gonz itez

Ing. Juan G. Muriel Figueras

Ing. José &. Deliz Alvaree

Ing. Nanuet ?Farquez Rivers

Ing. Guillermo Pérez Martinez

: 10. Ing: Carlos Rad} Guerra

Esta Comisién celebré un sinntirera de reuniones con el

propdsito de curplir con el requcriniento de la Resoluciin inclu

° ?yenda, una vista pablica para los mic:bras de este Colegio y varias

Treunfones con acencias y personas instruidas en este ceipo.

g La vista piblica, fue celotrada el sSbado 18 de octubre de

5-76 1375) ?n el Colegio de Ingcnieros, Arquitectos y Agrincrsures donde

depusieron las siguientes perscnas

Ing. Juan José Sénchez

Arq: Gonzalo Fernés

Dr. Donald Sesser

Or. Juan A. Bonnet

Luego de encontrarnos en etaya avanzada, 1a Autorided de

Jes Fuentes Fluviales deterniné @ hizo saber pibiicenente 1a sus- 1

sign de gus actividades en el cerpo de 12 anargia nuclear por

tiespo indefinido. La futorided de las Fuentes Fluviales indicé W

como razén bésica para esta proposicidn, que Puerto Rico no necesita

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_ Frovcisee Quifenas

a2 2 te julio ?a 1976

una planta nucleir por los proxinos dies afns (1985); y que el alto

costo del proyecto requeriria unos Financianientos demsiado altos

para Yas circuntancias del maccido actual y d= Puerto Rico.

Se indic6 adur$s, que 1a Autoridad continuard explorend

soStos alternos que Te per iitan provicir enci sia eléctrica que

Fecrasente costos nds bajos en las tarifas de energfa, Dada esta

sitmetén nuestra Comisién deterainé el no continuar con los tra

tales solve plantas nucleares.

Aan asf y ya que a través de las reuaionos, vistas y entre-

vistas contibaros con algunos datos sobre 1a problenitica energét icay

isiSn consider6 pertinente el investigar la situaciGn energética

en Puerto Rico mds a fondo y el impacto que esta situacidn puliese

tener en nuestro Colegio.

De nucstras invest igacfones surgen varies hechos sunsrente reniticos, los cuales puedon terer un inpacto decisivo sobre el

futuro econGnico, polftica y social de nuestra Isla. Puerto Rico

dopende casi en un 100% de cnergfa producida por combustible £6541

Fira Menar asf sus necesidades. Este coubustible fésil provic

fn Su totalidad de fucra de Puerto Rico, Je unos patses que cust

con la mayor parte de Tas reservas sundiales de este producto. Se

conocen unas resarvas de covbustibles fSsiles on el unio que de

coutinuarse Ta utilizecién Je la razcn actual consunirtan todo

este petrdleo en el place de una gen. racion.

a

Al presente no existe una alternativa tecnoléyica que par

si sola pucda sustituir ni siquiera una parte significativa del

Petrdleo que es utilizaco cosa combustible. La encrgia nuclear ein tiene un vacfo en tecnologia lo cual no ha periizido que asta ise a ser el sustituto del petrdleo. Sin enbargo, cresvas que es totalmente factible, el que se pueda lograr en un futuro no Ted el desarrollo de eneryia nuclear Vinpia, segura y eficiente, y por tanto debevos foscntar un programa de planificactén cnergética tendiente hacia el desarrollo futuro de esta fuente de energia.

Luego de considerar las principales alternativas para uso ge enevgia, podesos concluir que en base a la tecnologia presente, la producci6n de energia eléctrica en cantidades significetivas 0 eccnduicumente factibles por medio de fuentes tales cono la energia solar y 1a fusign nuclear se encuentran de veinte a treinta afos en el futuro.

Si consideranos que dedo el valor finito de as reserves de petréleo en el mundo, el precio de este continuaré increnentén-dose, y ante los canocinientos y desarrollos tecnolégicos. actuales,, yde'no haber un hallazgo inesperado nos queda cono Enica alterna.

tiva realista y conercielnente viable de aqui al 1995 el utilizar 1

Ja cnergfa nuclear, 0 de otro modo el reducir considerablenente a

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22 Ate julio vo 1976

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Sin exlorgo, enten-

?85 que uno de Tos factores principales para la crisis gic afronsas e8 que se ha dicho mucto y se ha hecho poco para resolver

wstros problemas.

Rocossontavas que ol Colegio de Ingunivros, Arquitectos y

ares ade? fs de fovcntar los investigae fones on Aisarroloy

tora una participectiin activa en la persccusicn ge solucicnss y la

accién positiva de nuestros colesiadss en esta direecién. Lar

Aacién da esta Conisién es 1a siguiente

Que el Colegio de Ingevieros, Arquitectos y Agr ixcasores

ree una Conisign pervanente y ascgure Tos fondas necesarios que porwitan Tas sigutentes tarsis:

1. Que se inicien las actividades indicadas en los

?Por Tentos" Ly 3 de 1a Resolucidn A-004 del 1975, que Teen cow

(1) "Que et Colegio de Ingenieros, Ariuitectos y

Agrinenseres de Pucrto Rico, establesca un

prograra ¢e orienteci6n al pueblo sobre 1a

alternativa del uso de la energia nuclear

como Ta fuente de energfa

(3) Que el C.1.A.A. comparezca a través de su

Presidente ode los representantes autor izados

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ic Posse, An economic and social analysis; a study fn industrial

tien and'regianal ecoraaic develo; ?ont; W. Isard, U. whitney,

N.Y., Bulliston, 1952

Bosiets O. J. The EF

witey, 1973)

nents of Nuclear Power, N.Y.

Conference on tuclear Energy, Public Policy and the Law, flew York

Unterrstty, 1963. Editor ?. a)

Blovshcin School of Law

1. Atonie Powor- Law &

essays, lectures,

station - U.S. Addre

Ss

2. Atonic Power Industry = U.S. - Addressis, essays,

Tectures.

Dugger, Gordon L., editor; Procecdings Third sorkshop on Ocean.

Thorsai Enorgy Conversion, Heunston, Texas, May 1975,

Quyger, Gordon L.; U. S. Congress ¥ol. 21.-w0.38 (9/22/75)

A fearing on the drouw's Ferry Nuclear Plant Fire by the Joint

Covsittee on Atcwie Energy.

k of the atomic energy industry, Editor S. Jefferson,

N.Y. Pitman Pub. Cor. 1958

Hogerton, John. The Atomic Energy Destbook. N. Y.y

Reinhold Pub. Corp. 1963

International Conference on the Peaceful Use of Atonic Eneray

Ist Genova Congress, 1955.

International Conference on the Peaceful Uses of Atonic

ray, 3rd. Genova, 1964

Intere.crican Symposicn on the Peaceful Applies of tuclear Enceay.

Sth. Valparaiso, Chile, 1964

Washington, Pan Anerican Union, 1965

Jaro fsyda. Energfa Kuclear y derecho: Simposio Inter-arericano

U.P. R. 1966

Journal of Nuclear Energy ~ Revista - Perganon Press

August 1959 - June 1959

Fayne A. The prospects for uclear Energy in P. R.,

Washington National Planning Association, 1958 ot

---Page Break---

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ar in Industry, 1995, N.Y, Pitsan Pub, Corp.

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1. Muctesr e:

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crt, B.C. Atusic Energy Application, with reference to

?aleped countries =a preliainery sin vy. Baltinore,

Zohn Hopkins Press, 1987

fica for Econeny, Cogperation ard Dey. European

jaar Thergy Agency. Ruclear Legislation:

analytical study, Grganization and gencral regine

ning nuclear activities (Paris) 0.F.C.D. 1959

Reactor Fuel Processing 1968 - Atonte Energy Co: atssion

Rocicen, A. Introduction to Ruclear Poxer Costs

N. ¥., Sissons ~ Brardcan, Publisher Cor,

1959

Shilling, C. WM. (editor) Atomic Encray Encyctopadia in the

Life Sciences. Philadelphia, W. 8. Souncrs, Co., 1964.

Schutey S. He (editor) (Traducctén ca espafiol) Pian Economics

of Atomic Power, fn exploratory study under direction of S. H.

Sciurr & J, Herschak Cowles Cenissfon Tor Research in

Eecroules. Princeton Univesity Press, 1950

Teiteitium, P. 0. Huctear energy and the U.S. fuel econony,

1955 -'1960. Hashington National Planning Associatfon, 1958.

1. Products and Uses of tuctear Energy

UL S. Atomic Energy Couaission. Atoaie encrgy facts; a surmary,

1957. U. S. Governcent Printing Office

U.S. Atomic Energy Coomission Report 23rd. - 1958. U. S.

Government Printing Office

U.S. P. R. Nuclear Center, Haysquez - Sinopsis sobre Energia

fiuciear y el Desarrollo de L. A, 30-31- de octubre de 1967.

Editorial U.P. R. 1969.

---Page Break---

2 (Bi teeg ffa) (3)

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15, Sune 25, 1973

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Reactor Safety Study. An assosrcnt of Acchtont Risks in U. S. Co

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